Search Report EIC 1700

STIC Database Tracking Number: 236196

To: MICHAEL BERNSHTEYN
Location: REM-10D25
Art Unit: 1713
Thursday, September 06, 2007

Case Serial Number: 10/530965

From: MEI HUANG
Location: EIC1700
REM-4B28 / REM-4B31
Phone: (571)272-3952

mei.huang@uspto.gov

Search Notes

Examiner BERNSHTEYN:

Please feel free to contact me if you have any questions or if you would like to refine the search query. Thank you for using STIC services!

Regards,
Mei

RUSH

Access DB# 236480

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Michael Bernstein Examiner # : 81515 Date: 09/05/07
Art Unit: 1713 Phone Number 30 272-2411 Serial Number: 10/530,965
Mail Box and Bldg/Room Location: Rem 10D25 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Composite ion-exchange membrane

Inventors (please provide full names): Kota Kitamura; Yoshimitsu Sakaguchi; Shigenori Nagahara, Shiro Hamamoto; Naohiko Takimoto, etc.

Earliest Priority Filing Date: 10/17/2002

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Please try to find all compound of formulas 2A, 2B, and 3-7 according the limitations of claims 2-7 and 20-28.

Thank you
M. Bernstein.

****

STAFF USE ONLY

Searcher: MH
Searcher Phone #:
Searcher Location:
Date Searcher Picked Up:
Date Completed: 9/6/07
Searcher Prep & Review Time:
Clerical Prep Time:
Online Time:

Type of Search

NA Sequence (#)
AA Sequence (#)
Structure (#) 3
Bibliographic
Litigation
Fulltext
Patent Family
Other

Vendors and cost where applicable

STN ✓
Dialog
Questel/Orbit
Dr.Link
Lexis/Nexis
Sequence Systems
WWW/Internet
Other (specify)

PTO-1590 (8-01)

In the Claims:

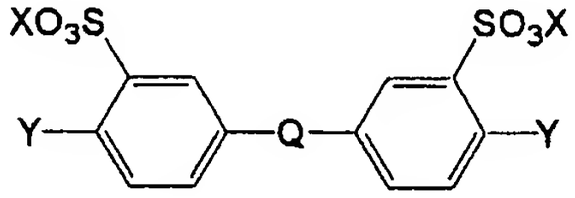
Amend the claims as follows:

1. (Original) A composite ion exchange membrane comprising an ion exchange resin composition, and a support membrane having a continuous pore penetrating the support membrane, wherein

said support membrane is a support membrane which accepts said ion exchange resin composition within said pore, and

said ion exchange resin composition is an ion exchange resin composition which contains an ion exchange resin containing, as a main component, an aromatic polyether and/or its derivative, the aromatic polyether being obtained by mixing a monomer component which contains, as main ingredients, a compound represented by Chemical Formula 1, an aromatic dihalogenated compound and a bisphenol compound with a carbonate and/or a bicarbonate of an alkali metal and polymerizing the mixture in an organic solvent:

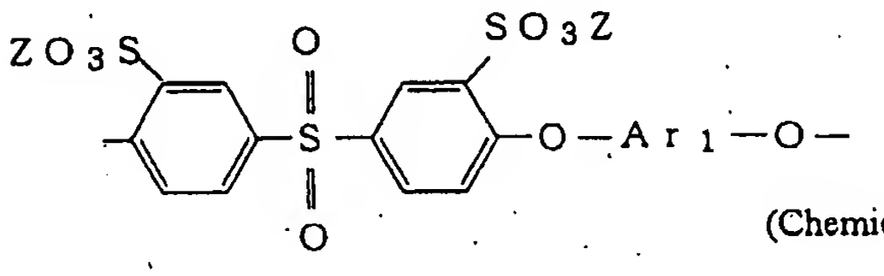
(in Chemical Formula 1, Q represents a $-S(=O)_2-$ group or a $-C(=O)-$ group; X represents an H atom, an Li atom, an Na atom or a K atom; and Y represents an F atom, a Cl atom, a Br atom or an I atom).



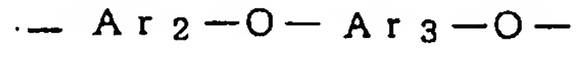
(Chemical Formula 1)

2. (Original) A composite ion exchange membrane comprising an ion exchange resin composition, and a support membrane having a continuous pores penetrating the support membrane, wherein said support membrane is a support membrane which accepts said ion exchange resin composition within said pore, and said ion exchange resin composition is an ion exchange resin composition which contains an ion exchange resin including linking units represented by Chemical Formula 2A and linking units represented by Chemical Formula 2B at a ratio,

Chemical Formula 2A : Chemical Formula 2B = n : m, respectively:



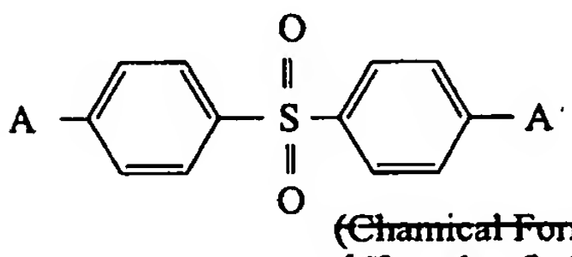
(Chemical Formula 2A)



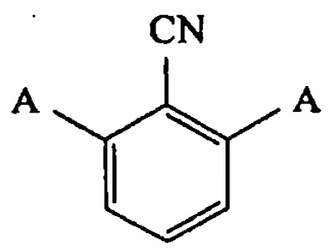
(Chemical Formula 2B)

(in Chemical Formulas 2A and 2B, Z represents H, Li, Na, K or a cation derived from an aliphatic or aromatic amine; Ar_1 and Ar_3 independently represent one or more kinds of bivalent organic group; Ar_2 represents one or more kinds of bivalent organic group including an aromatic ring having an electron-withdrawing group; and n and m represent an integer within a range of 1 to 1000 and an integer within a range of 0 to 1000, respectively).

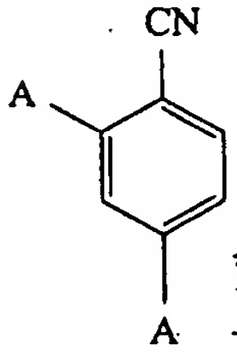
3. (Currently amended) The composite ion exchange membrane according to claim 2, wherein said Ar_2 is one or more kinds of linking unit selected from the group consisting of linking units represented by Chemical Formula 3, Chemical Formula 4 and Chemical Formula 5:



~~(Chamical Formula 3)~~
(Chemical Formula 3)



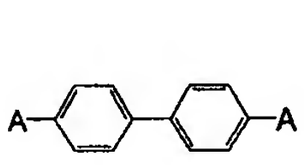
~~(Chamical Formula 4)~~
(Chemical Formula 4)



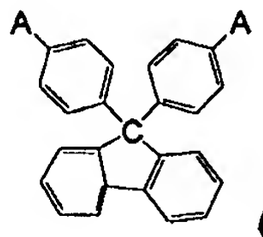
~~(Chamical Formula 5)~~
(Chemical Formula 5)

(in Chemical Formulas 3 to 5, A represents in each occurrence a linking site with another linking unit).

4. (Currently amended) The composite ion exchange membrane according to claim 2, wherein said Ar_1 and said Ar_3 each are one or more kinds of linking unit selected independently from the group consisting of linking units represented by Chemical Formula 6 and Chemical Formula 7:



~~(Chamical Formula 6)~~
(Chemical Formula 6)



~~(Chamical Formula 7)~~
(Chemical Formula 7)

(in Chemical Formula 6 and Chemical Formula 7, A represents in each occurrence a linking site with another linking unit).

5. (Original) The composite ion exchange membrane according to claim 2, wherein said Ar_1 and said Ar_3 each are a linking unit represented by said Chemical Formula 6, said Ar_2 is a linking unit represented by said Chemical Formula 3, and said n and said m each are an integer within a range of 1 to 1000 which satisfies Mathematical Expression 1:

$0.2 \leq n/(n + m) \leq 0.8$ (Mathematical Expression 1).

6. (Original) The composite ion exchange membrane according to claim 2, wherein said Ar_1 and said Ar_3 each are a linking unit represented by said Chemical Formula 6, said Ar_2 is a linking unit represented by said Chemical Formula 4, and said n and said m each are an integer within a range of 1 to 1000 which satisfies Mathematical Expression 2:

$0.2 \leq n/(n + m) \leq 0.8$ (Mathematical Expression 2).

7. (Original) The composite ion exchange membrane according to claim 2, wherein said Ar_1 and said Ar_3 each are a linking unit represented by said Chemical Formula 7, said Ar_2 is a linking unit represented by said Chemical Formula 3, and said n and said m each are an integer within a range of 1 to 1000 which satisfies

20. (New) The composite ion exchange membrane according to claim 2, which has a surface layer comprising said ion exchange resin composition on each side of said support membrane.

21. (New) The composite ion exchange membrane according to claim 20, wherein the thickness of each of said surface layers is within a range of 1 to 50 μm and also is within a range which does not exceed half the total thickness of said composite ion exchange membrane.

22. (New) The composite ion exchange membrane according to claim 20, wherein at least one surface of said support membrane has an aperture ratio within a range of 40 to 95%.

23. (New) The composite ion exchange membrane according to claim 20, wherein said support membrane contains a polybenzazole-type polymer as a material.

24. (New) The composite ion exchange membrane according to claim 21, wherein said support membrane contains a polybenzazole-type polymer as a material.

25. (New) The composite ion exchange membrane according to claim 22, wherein said support membrane contains a polybenzazole-type polymer as a material.

26. (New) The composite ion exchange membrane according to claim 23, wherein said support membrane is obtained by shaping an isotropic solution containing said polybenzazole-type polymer in a content within a range of 0.5 to 2% by mass into film and then solidifying the solution.

27. (New) The composite ion exchange membrane according to claim 2, wherein when a straight line running through the composite ion exchange membrane along its thickness direction is set in an analysis area in a cross section of said composite ion exchange membrane and a linear analysis for elements contained only

in the ion exchange resin is conducted using an electron probe microanalyzer, the variation in the number of X-ray counted, as indicated in CV value, is within 50%.

28. (New) The composite ion exchange membrane according to claim 2, wherein when a straight line running through the composite ion exchange membrane along its thickness direction is set in an analysis area in a cross section of said composite ion exchange membrane and a linear analysis for elements contained only in the ion exchange resin is conducted using an electron probe microanalyzer, the number of the analysis points where the number of the counted X-rays of the analyzed elements is 5% or less relative to the maximum number is within a range of 0 to 30% of the number of all the analysis points.

STIC Search Results Feedback Form

EIC17000

Questions about the scope or the results of the search? Contact *the EIC searcher or contact:*

Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 1713*
- *Relevant prior art* ***found****, search results used as follows:*
  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
  (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art not found:*
  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

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STRUCTURE FILE UPDATES:     5 SEP 2007  HIGHEST RN 946114-43-8
DICTIONARY FILE UPDATES:    5 SEP 2007  HIGHEST RN 946114-43-8

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L3                  STR
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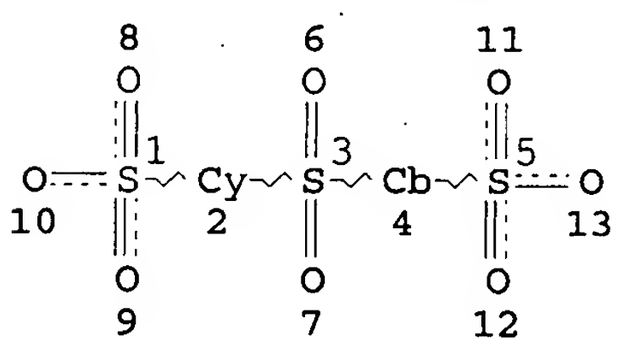


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STEREO ATTRIBUTES: NONE
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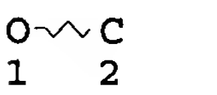


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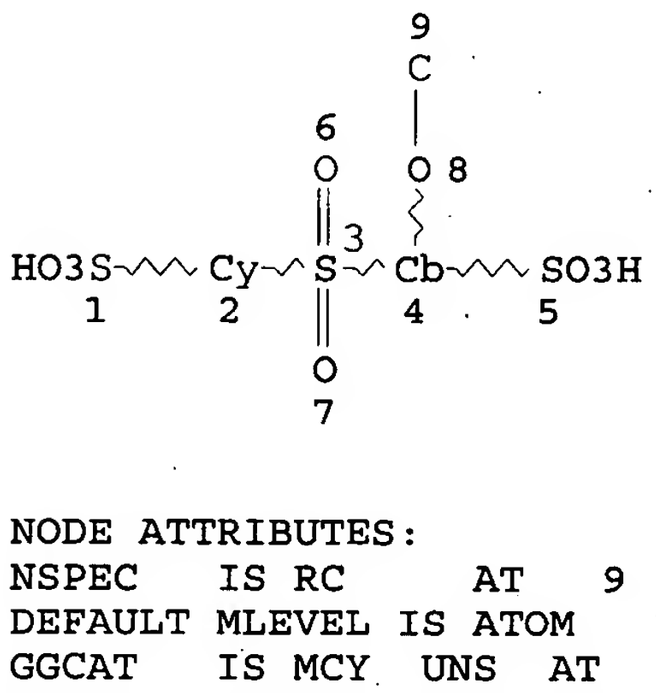

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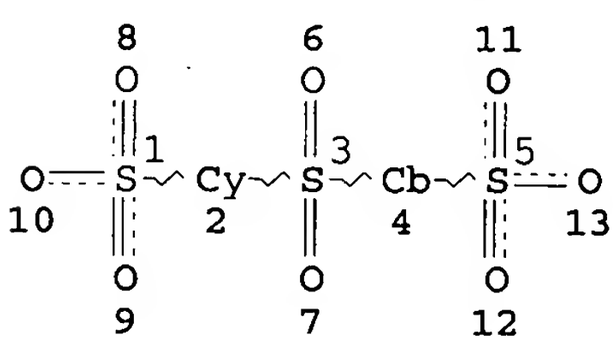

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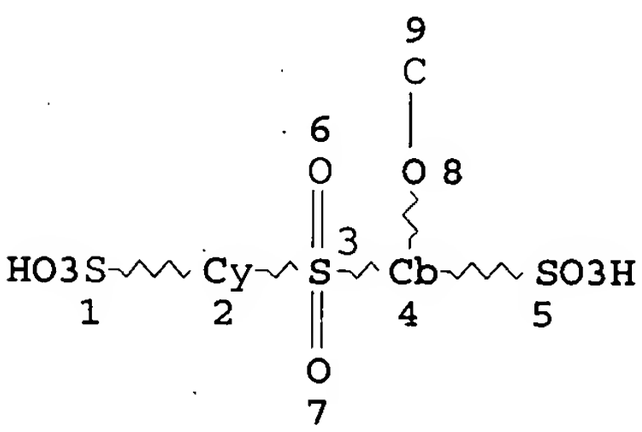

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NUMBER OF NODES IS 9

STEREO ATTRIBUTES: NONE
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L22              QUE ABB=ON  PLU=ON  (ION OR CATION OR ANION)(2A)EXCHANG?
L23           43 SEA ABB=ON  PLU=ON  L21 AND L22
L24           11 SEA ABB=ON  PLU=ON  L23 AND (PY<=2003 OR PRY<=2003 OR
                 AY<=2003)
L25           40 SEA ABB=ON  PLU=ON  L24 OR L19


=> fil hcap

MHuang REM4B31 571-272-3952                              09/06/2007
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FILE 'HCAPLUS' ENTERED AT 14:49:44 ON 06 SEP 2007

FILE COVERS 1907 - 6 Sep 2007 VOL 147 ISS 11
FILE LAST UPDATED: 5 Sep 2007 (20070905/ED)

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=> d l19 ibib abs hitstr hitind 1-29

L19 ANSWER 1 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2007:357845 HCAPLUS
DOCUMENT NUMBER: 146:380936
TITLE: Mixtures of sulfonated and phosphonated polymers as high temperature membranes for fuel cells
INVENTOR(S): Haering, Thomas
PATENT ASSIGNEE(S): Driess, Stefan, Michael, UK
SOURCE: PCT Int. Appl., 34pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

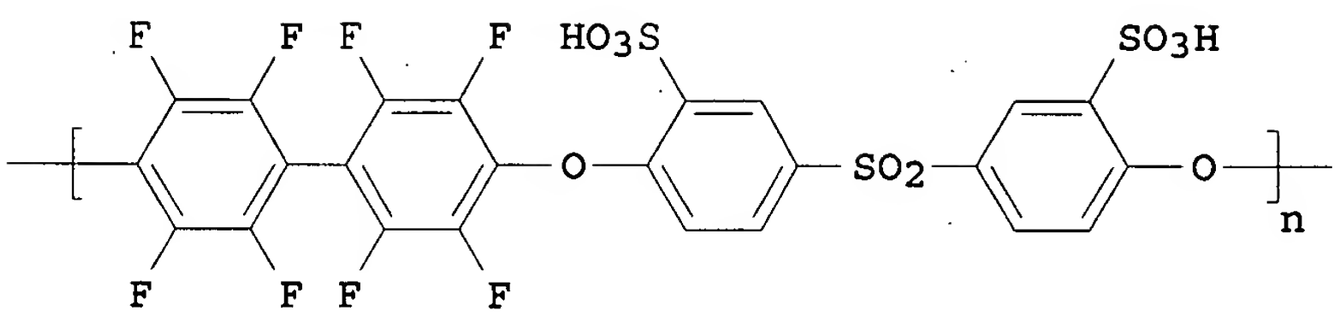
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2007034337	A2	20070329	WO 2006-IB3879	200609 22

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

PRIORITY APPLN. INFO.: WO 2006-IB3879 200609

MHuang REM4B31 571-272-3952 09/06/2007

GI



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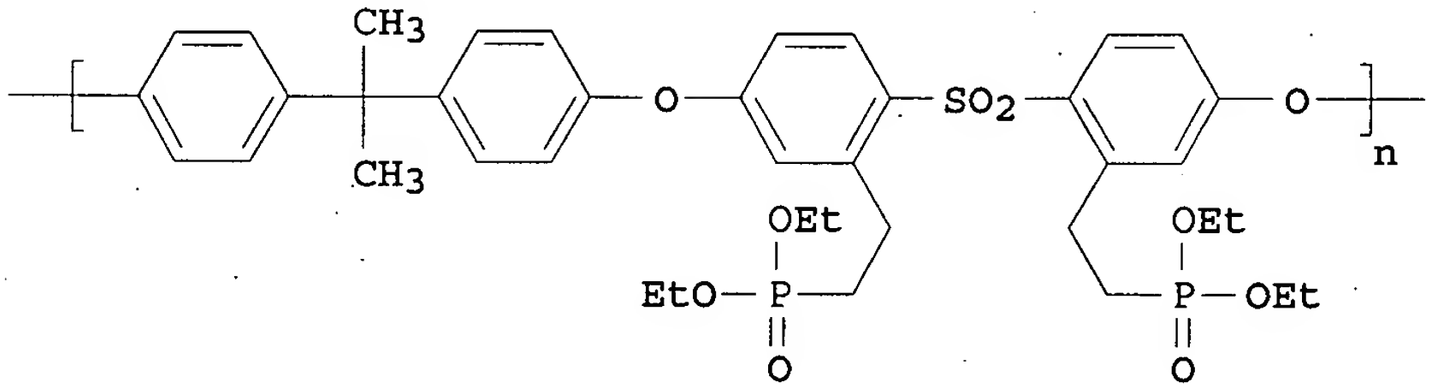


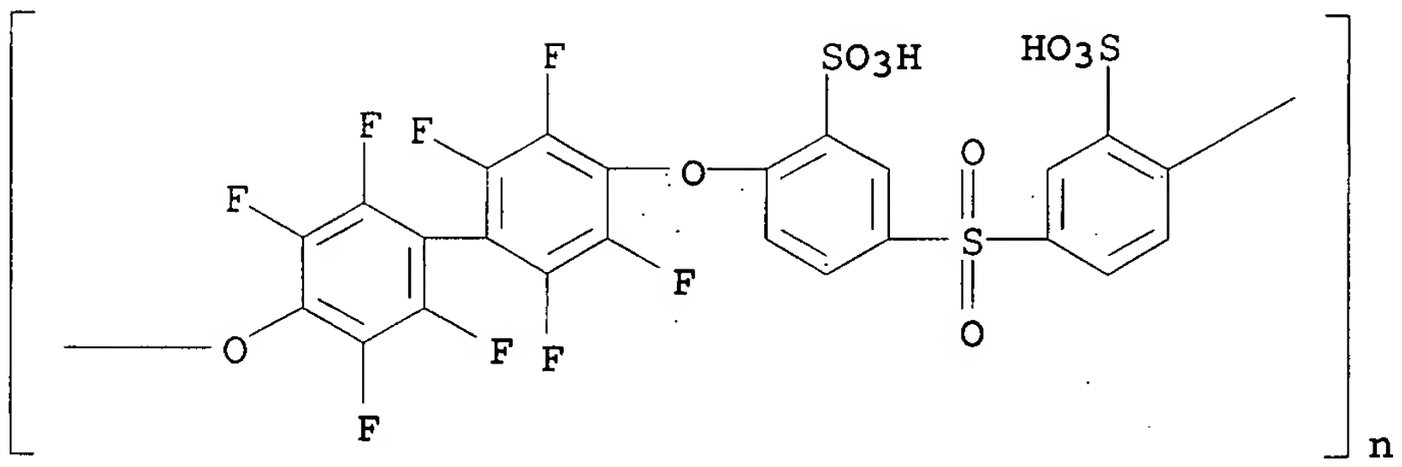
II

AB Blends of sulfonated, partially fluorinated or non-fluorinated aromatic polymers such as, an example, I and sulfonated or/and phosphonated statistical or block aromatic polymers in which sulfonate and phosphonate groups being bonded either directly to the aromatic main chain or, at the end of an alkyl or perfluoroalkyl side chain such as, an example, II are used as membranes in high temperature (≥100°) fuel cells. Thus, a typical membrane is prepared by mixing a solution 2.75 g sulfonated, partially fluorinated polyether sulfone in 24.75 g NMP and 0.25 g phosphonated polysulfone in 2.25 g NMPO and coating onto a glass substrate followed by removing a solvent at 130°. The resulting membrane was treated in water bag with 10% HBr 8 h to hydrolyze phosphonates and with water 48 h at 60°.

IT **930786-15-5**
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(blend with phosphonated polymers; blends of sulfonated, partially fluorinated sulfonated or/and phosphonated statistical or blocked aromatic polymers as membranes in high temperature fuel cells)

RN 930786-15-5 HCAPLUS

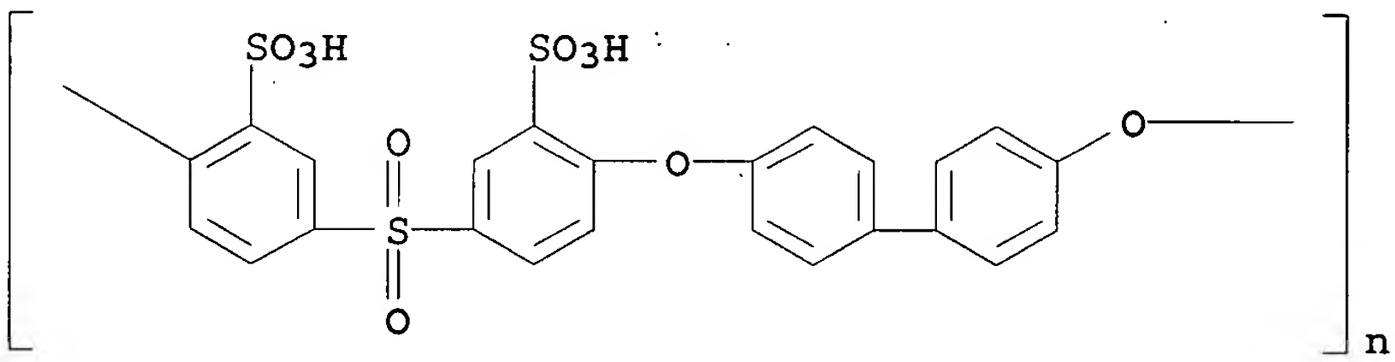
CN Poly[oxy(2,2',3,3',5,5',6,6'-octafluoro[1,1'-biphenyl]-4,4'-diyl)oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)] (CA INDEX NAME)



IC ICM C08L
CC 37-6 (Plastics Manufacture and Processing)
IT **930786-15-5**
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(blend with phosphonated polymers; blends of sulfonated, partially fluorinated sulfonated or/and phosphonated statistical or blocked aromatic polymers as membranes in high temperature fuel cells)

L19 ANSWER 2 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2007:318192 HCAPLUS
DOCUMENT NUMBER: 146:482866
TITLE: Synthesis and characterization of sulfonated-fluorinated, hydrophilic-hydrophobic multiblock copolymers for proton exchange membranes
AUTHOR(S): Yu, Xiang; Roy, Abhishek; Dunn, Stuart; Yang, Juan; McGrath, James E.
CORPORATE SOURCE: Macromolecules and Interfaces Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Macromolecular Symposia (2006), 245/246(World Polymer Congress--MACRO 2006), 439-449
CODEN: MSYMEC; ISSN: 1022-1360
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Nanophase separated ionic-hydrophobic block copolymers may be more suitable as proton exchange membranes than random copolymers. A series of multiblock copolymers, composed of alternating segments of fully disulfonated poly(arylene ether sulfone) and highly fluorinated poly(arylene ether sulfone), were synthesized from hydrophilic and hydrophobic telechelic oligomers having a variation of mol. wts. The high reactivity of the fluorinated oligomers made unnecessary the use of high reaction temps., and thus the coupling reactions may be free of ether-ether interchange side reactions. The copolymers were characterized with regard to proton conductivity, water uptake and self-diffusion coefficient of water, and the results were compared to those of Nafion and a partially disulfonated BPSH-35 random copolymer.
IT **751480-76-9P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(oligomer; preparation of sulfonated, fluorinated, and hydrophilic-hydrophobic multiblock copolymers for proton exchange membranes)
RN 751480-76-9 HCAPLUS

CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)] (CA INDEX NAME)



CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 52

IT 681849-12-7P, Bis(4-hydroxyphenyl) sulfone-decafluorobiphenyl copolymer **751480-76-9P** 911358-39-9P 935761-56-1P
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(oligomer; preparation of sulfonated, fluorinated, and hydrophilic-hydrophobic multiblock copolymers for proton exchange membranes)

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 3 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2007:223810 HCAPLUS
DOCUMENT NUMBER: 146:299214
TITLE: Fuel cell catalysts containing carbonaceous materials, their films, membrane-electrode assemblies, and polymer electrolyte fuel cells
INVENTOR(S): Inasaki, Takeshi; Nomura, Kimiatsu
PATENT ASSIGNEE(S): Fuji Photo Film Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 64pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

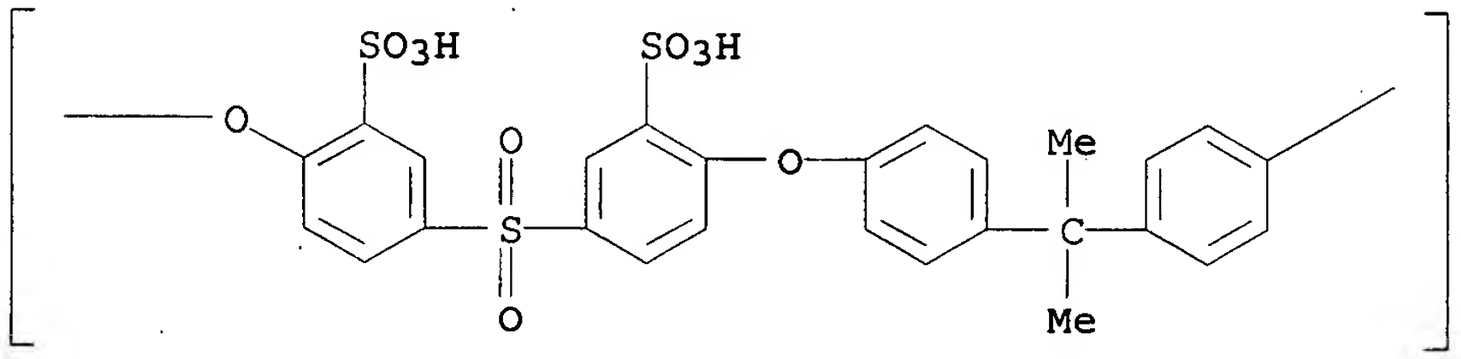
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2007053086	A	20070301	JP 2006-199261	20060721
PRIORITY APPLN. INFO.:			JP 2005-211856	A 20050721

AB The catalysts contain carbonaceous material supports bonded to polymers bearing solvolysis- and heat-resistant groups, and ionic functional groups via solvolysis- and heat-resistant linkages. The films contain the catalysts, solid electrolytes, and optionally other carbonaceous material-containing catalysts without the polymers. The membrane-electrode assemblies show high catalyst utilization efficiency and good durability.

IT **146673-85-0DP**, reaction product with bromopentoxylated

carbon black or carbon nanotube **927679-96-7DP**, reaction product with bromopentoxylated carbon black
RL: CAT (Catalyst use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(catalyst films containing carbonaceous materials with ionic functional groups for polymer electrolyte fuel cells)

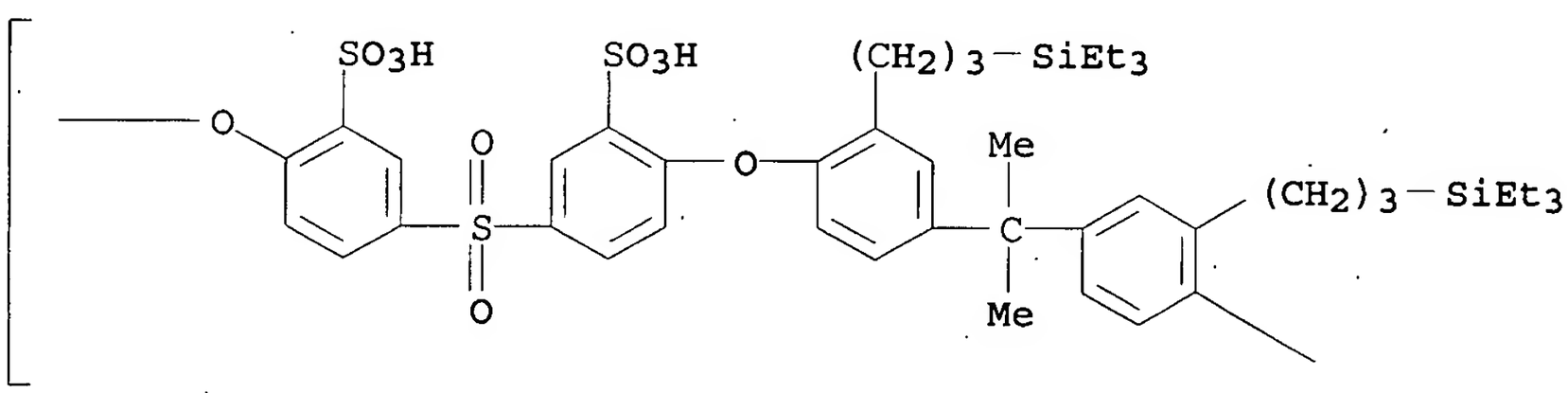
RN 146673-85-0 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene(1-methylethylidene)-1,4-phenylene sodium salt (1:2)] (CA INDEX NAME)



●2 Na

RN 927679-96-7 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy[2-[3-(triethylsilyl)propyl]-1,4-phenylene](1-methylethylidene)[3-[3-(triethylsilyl)propyl]-1,4-phenylene] sodium salt (1:2)] (CA INDEX NAME)

PAGE 1-A



●2 Na

PAGE 1-B

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
IT 111-24-0DP, 1,5-Dibromopentane, reaction product with carbon black and sulfo-containing polyether-polysulfone 3229-00-3DP, Pentaerythrityl tetrabromide, reaction product with carbon black and sulfo- and triethylsilyl-containing polyether-polysulfone 7440-06-4P, Platinum, uses 25135-51-7DP, reaction product with carbon black bromo derivative, chloromethylated, graft polymer with lithium sulfopropyloxystyrene and trimethylsilyloxystyrene, hydrolyzed 25154-01-2DP, reaction product with carbon black bromo derivative, chloromethylated, graft polymer with lithium sulfopropyloxystyrene and trimethylsilyloxystyrene, hydrolyzed 72355-90-9DP, reaction product with bromopentoxylated carbon black or carbon nanotube **146673-85-0DP**, reaction product with bromopentoxylated carbon black or carbon nanotube 342047-78-3DP, reaction product with bromopentoxylated carbon black 342047-79-4DP, reaction product with bromopentoxylated carbon black 904911-37-1DP, graft copolymer with carbon black-bound chloromethylated polyether-polysulfone and trimethylsilylpropyloxystyrene, hydrolyzed 927679-95-6DP, reaction product with bromopentoxylated carbon black **927679-96-7DP**, reaction product with bromopentoxylated carbon black 927679-98-9DP, graft copolymer with carbon black-bound chloromethylated polyether-polysulfone and lithium sulfopropyloxystyrene, hydrolyzed 927679-99-0DP, reaction product with carbon black
RL: CAT (Catalyst use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(catalyst films containing carbonaceous materials with ionic functional groups for polymer electrolyte fuel cells)

L19 ANSWER 4 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2007:40436 HCAPLUS
DOCUMENT NUMBER: 146:296321
TITLE: Multiblock copolymers of poly(2,5-benzophenone) and disulfonated poly(arylene ether sulfone) for proton-exchange membranes. I. Synthesis and characterization
AUTHOR(S): Wang, Hang; Badami, Anand S.; Roy, Abhishek; McGrath, James E.
CORPORATE SOURCE: Macromolecules and Interfaces Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Journal of Polymer Science, Part A: Polymer Chemistry (2006), Volume Date 2007, 45(2), 284-294
CODEN: JPACEC; ISSN: 0887-624X

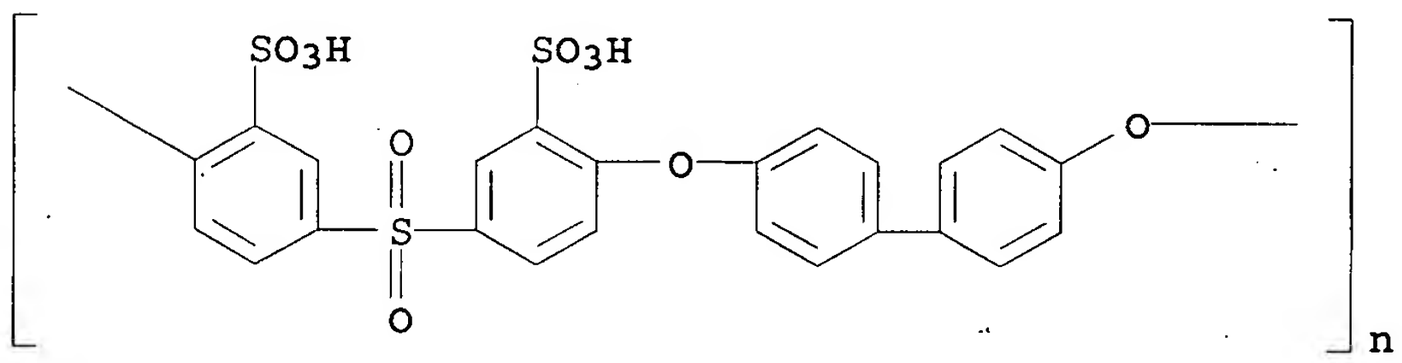
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Nanophase-separated, hydrophilic-hydrophobic multiblock copolymers are promising proton-exchange-membrane materials because of their ability to form various morphol. structures that enhance transport. A series of poly(2,5-benzophenone)-activated, telechelic aryl fluoride oligomers with different block mol. wts. were successfully synthesized by the Ni(0)-catalyzed coupling of 2,5-dichlorobenzophenone and the end-capping agent 4-chloro-4'-fluorobenzophenone. These telechelic oligomers (hydrophobic) were then copolymd. with phenoxide-terminated, disulfonated poly(arylene ether sulfone)s (hydrophilic) by nucleophilic, aromatic substitution to form hydrophilic-hydrophobic multiblock copolymers. High-mol.-weight multiblock copolymers with number-average block lengths ranging from 3000 to 10,000 g/mol were successfully synthesized. Two sep. glass-transition temps. were observed via differential scanning calorimetry in the transparent multiblock copolymer films when each block length was longer than 6000 g/mol. Tapping-mode atomic force microscopy also showed clear nanophase separation between the hydrophilic and hydrophobic domains and the influence of the block length as it increased from 6000 to 10,000 g/mol. Transparent and creasable films were solvent-cast and exhibited moderate proton conductivity and low water uptake. These copolymers are promising candidates for high-temperature proton-exchange membranes in fuel cells, which will be reported sep. in part II of this series.

IT **701915-80-2DP**, 4,4'-Biphenol-disodium 3,3'-disulfonate-4,4'-dichlorodiphenylsulfone copolymer, sru, potassium-exchanged
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(prepolymer; preparation and characterization of multiblock copolymers of poly(benzophenone) and disulfonated poly(arylene ether sulfone) for proton-exchange membranes)

RN 701915-80-2 HCAPLUS

CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) sodium salt (1:2)] (CA INDEX NAME)



CC 35-5 (Chemistry of Synthetic High Polymers)
Section cross-reference(s): 38

IT 2069-48-9DP, 4-Chloro-4'-fluorobenzophenone, reaction products with poly(benzophenone) 150347-09-4DP, 2,5-Dichlorobenzophenone homopolymer, reaction products with chlorofluorobenzophenone 389600-31-1DP, 4,4'-Biphenol-disodium 3,3'-disulfonate-4,4'-dichlorodiphenylsulfone copolymer, potassium-exchanged

530134-81-7DP, reaction products with chlorofluorobenzophenone
701915-80-2DP, 4,4'-Biphenol-disodium 3,3'-disulfonate-4,4'-dichlorodiphenylsulfone copolymer, sru, potassium-exchanged
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(prepolymer; preparation and characterization of multiblock copolymers of poly(benzophenone) and disulfonated poly(arylene ether sulfone) for proton-exchange membranes)

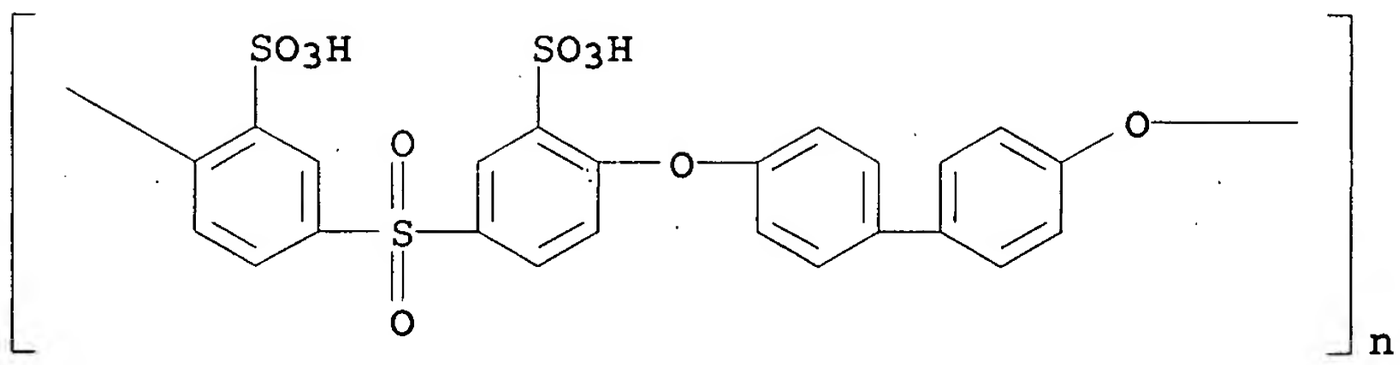
REFERENCE COUNT: 28 THERE ARE 28 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 5 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:1135706 HCAPLUS
DOCUMENT NUMBER: 146:103841
TITLE: Improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells
AUTHOR(S): Xing, D.; Kerres, J.
CORPORATE SOURCE: Institut fuer Chemische Verfahrenstechnik(ICVT), Universitaet Stuttgart, Stuttgart, Germany
SOURCE: Polymers for Advanced Technologies (2006), 17(7-8), 591-597
CODEN: PADTE5; ISSN: 1042-7147
PUBLISHER: John Wiley & Sons Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

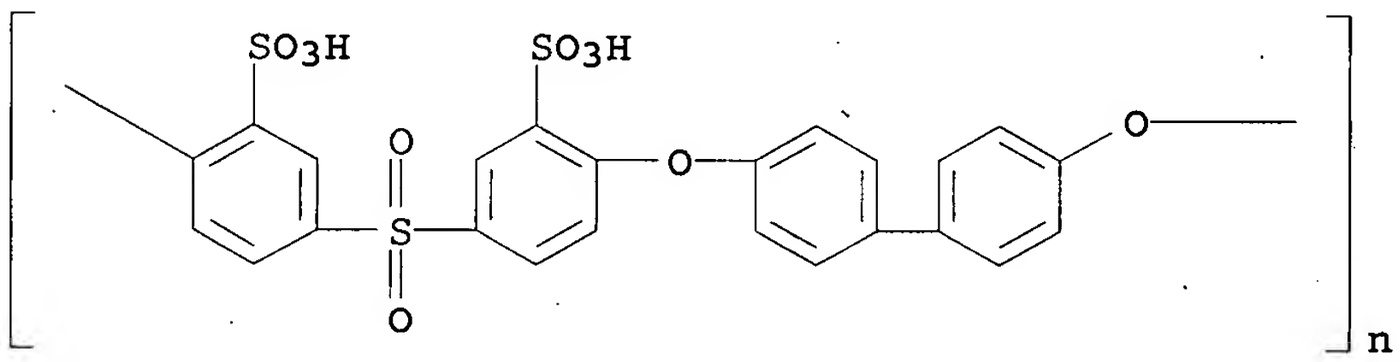
AB The performances of polyarylene ethers and sulfonated polyarylene ethers having different backbone structures and sulfonated position were comparatively studied focusing on the determination of the proton conductivity, thermal and chemical stability. The sulfone groups in polymer backbones are highly thermal stable. The sulfonic acid group at the metasulfone position had better thermal, chemical stability and higher proton conductivity than those at the ortho-ether and ortho-sulfone position. Stability is meta-sulfone sulfonated polyphenyl sulfone (SPSU) > ortho-sulfone SPSU >> ortho-ether SPSU. The knowledge of these parameters will give sulfonated arylene main-chain ionomers that are optimized for application in fuel cells. Also different sulfonated polyphenyl sulfone-4,4'-biphenol/polybenzimidazole (SPSU-BP/PBI) acid-base crosslinked blend membranes were studied. The SPSU/PBI crosslinked blend membranes had better mech. stability than their parent membrane while maintaining good thermal stability and having suitable proton conductivity

IT **751480-76-9DP**, propylammonium salts
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(blends with polybenzimidazole; improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)

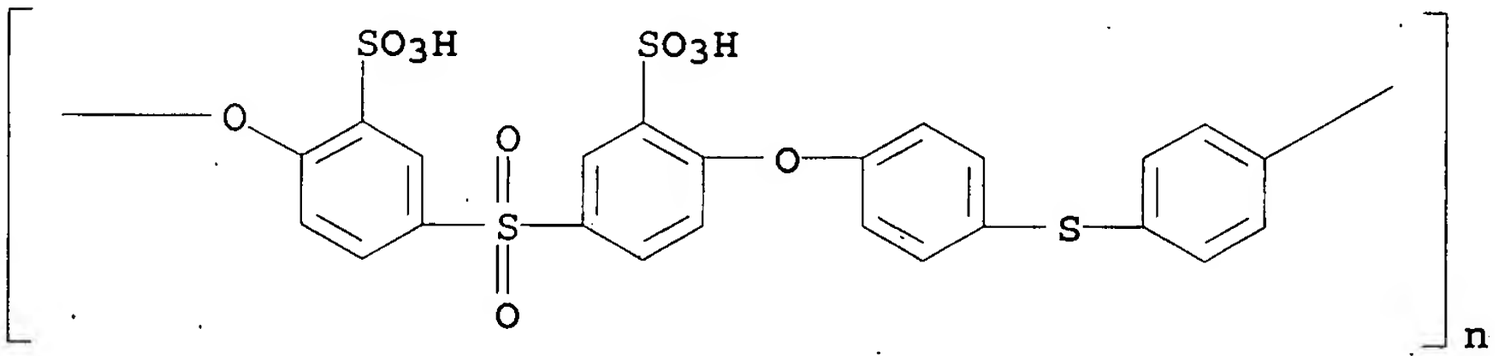
RN 751480-76-9 HCAPLUS
CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)] (CA INDEX NAME)



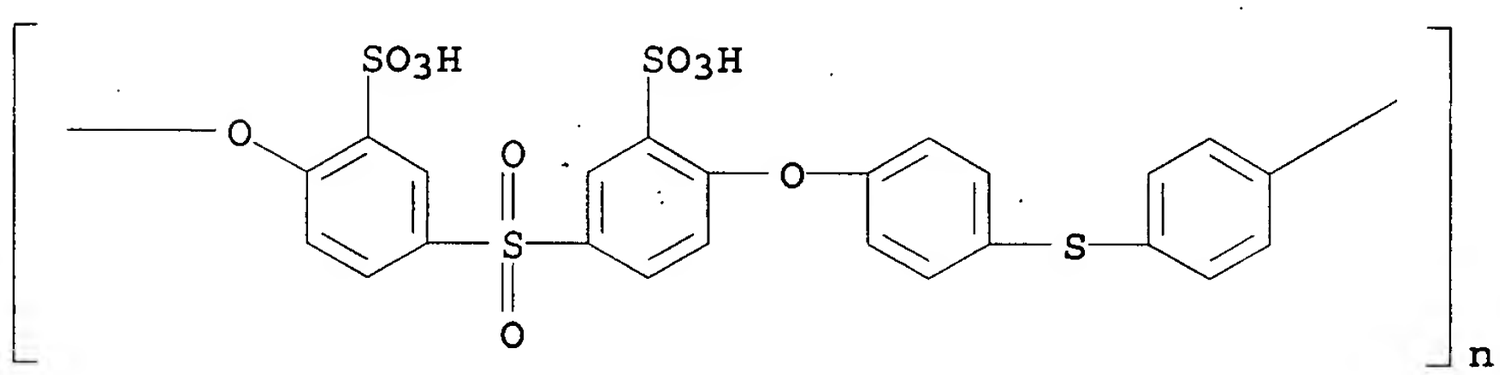
IT **751480-76-9P 912548-45-9P**
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)
RN 751480-76-9 HCAPLUS
CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)] (CA INDEX NAME)



RN 912548-45-9 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylenethio-1,4-phenylene] (CA INDEX NAME)

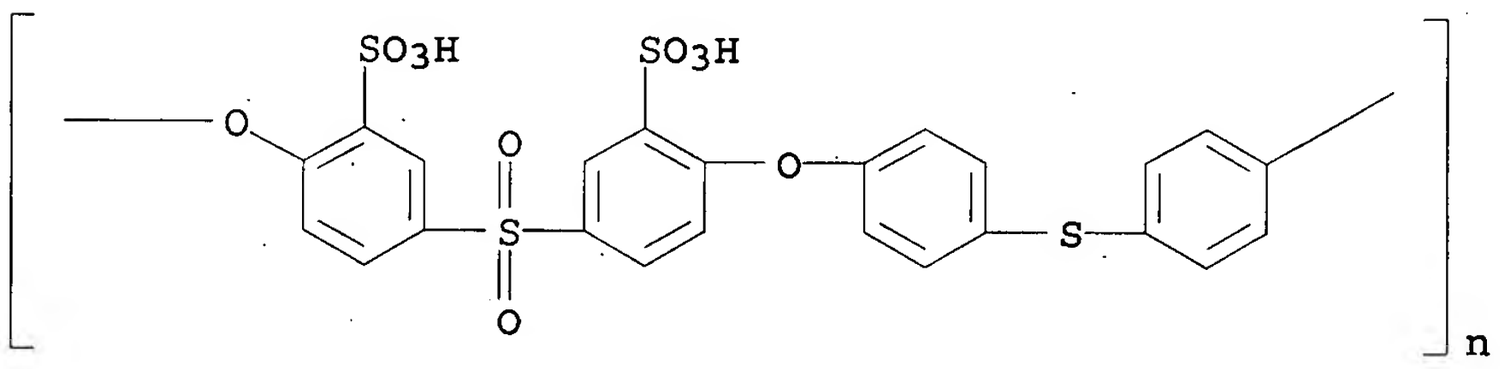


IT **917865-39-5P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)
RN 917865-39-5 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylenethio-1,4-phenylene sodium salt (1:2)] (CA INDEX NAME)



●2 Na

IT **912548-45-9DP**, proton-exchanged and propylammonium salts
RL: POF (Polymer in formulation); PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(neat and blends with polybenzimidazole; improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)
RN 912548-45-9 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylenethio-1,4-phenylene] (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35, 36, 38, 77
IT **751480-76-9DP**, propylammonium salts
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(blends with polybenzimidazole; improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)
IT **751480-76-9P 912548-45-9P** 917865-38-4P
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)
IT 301155-59-9P **917865-39-5P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)
IT **912548-45-9DP**, proton-exchanged and propylammonium salts
917865-38-4DP, proton-exchanged and propylammonium salts
RL: POF (Polymer in formulation); PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); TEM (Technical or engineered material

use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(neat and blends with polybenzimidazole; improved performance of sulfonated polyarylene ethers for proton exchange membrane fuel cells)

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

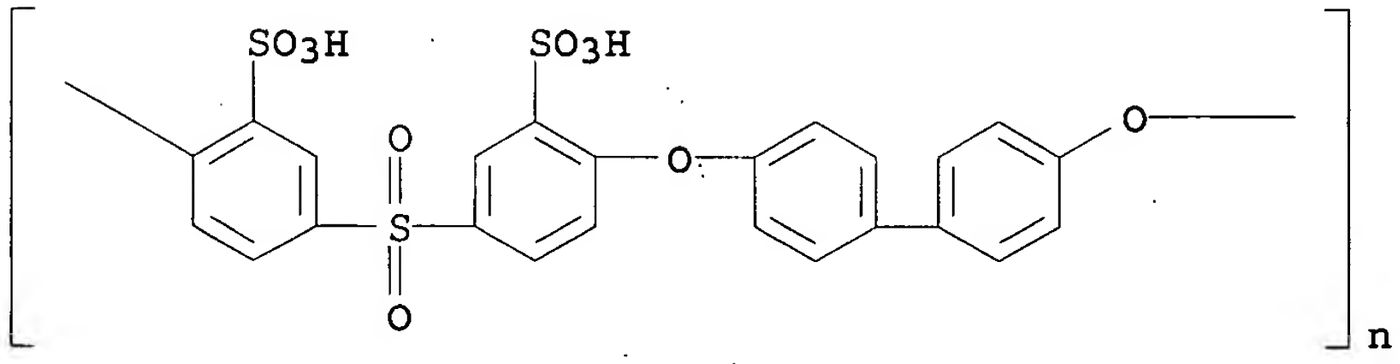
L19 ANSWER 6 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:1118630 HCAPLUS
DOCUMENT NUMBER: 145:422681
TITLE: Proton-conductive sulfonated polysulfones having superior durability for fuel cell electrolytes
INVENTOR(S): Yamaguchi, Takehisa; Ji, Mi; Yamashita, Koichi
PATENT ASSIGNEE(S): Tokyo University, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 19pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006291046	A	20061026	JP 2005-113995	20050411
PRIORITY APPLN. INFO.:			JP 2005-113995	20050411

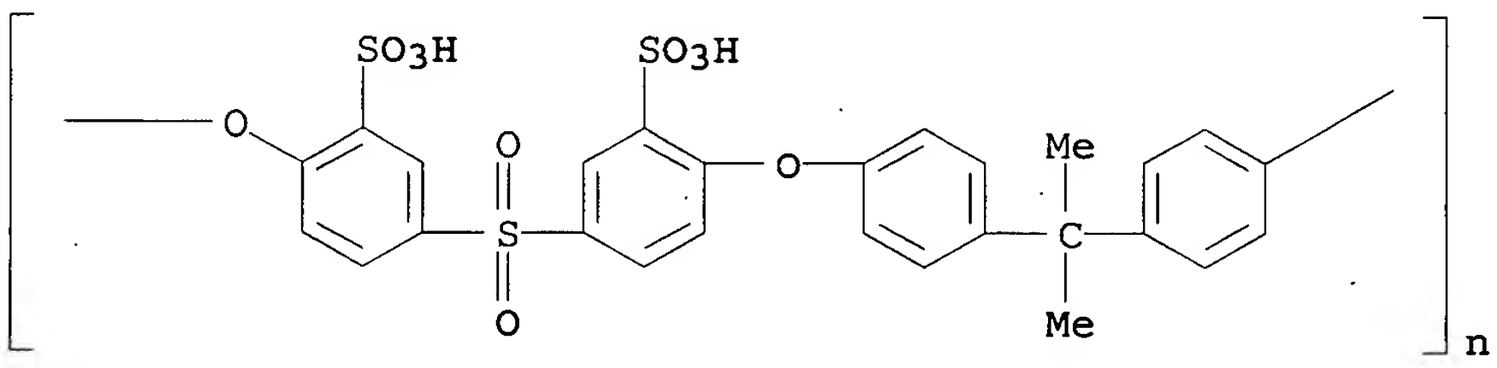
AB The polymers, having excellent resistance to peroxide or hydroxyl radicals, have a repeating unit prescribed as that oligomers having continuous four of the unit have lower calculated HOMO than that of control oligomers having continuous four of unit C6H3(o-SO3H)-p-SO2C6H3(m-SO3H)-p-C6H4-p-C6H4O. Also claimed are polymers having repeating unit C6H3(o-SO3H)-p-SO2C6H3(m-SO3H)-p-C6H4-nAnSO2-p-C6H4-mBmO (A, B = substituent; m, n = 0-4). Further claimed is a method for selecting high-durability polymers as that having lower HOMO than those of other candidates.

IT **751480-76-9P 753421-07-7P 912548-38-0P**
912548-40-4P 912548-43-7P 912548-45-9P
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(proton-conductive sulfonated polyethersulfones having high resistance against radical attack for fuel cell electrolytes)

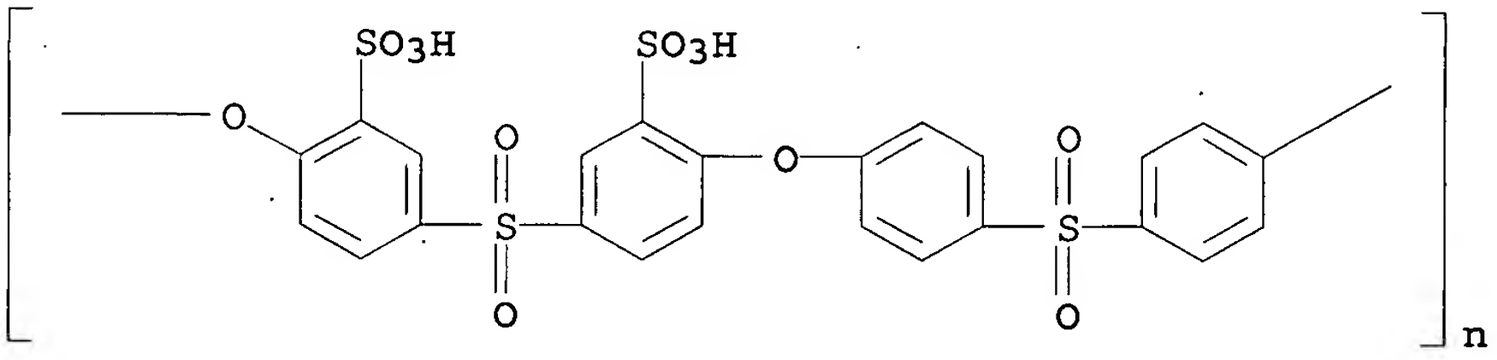
RN 751480-76-9 HCAPLUS
CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)] (CA INDEX NAME)



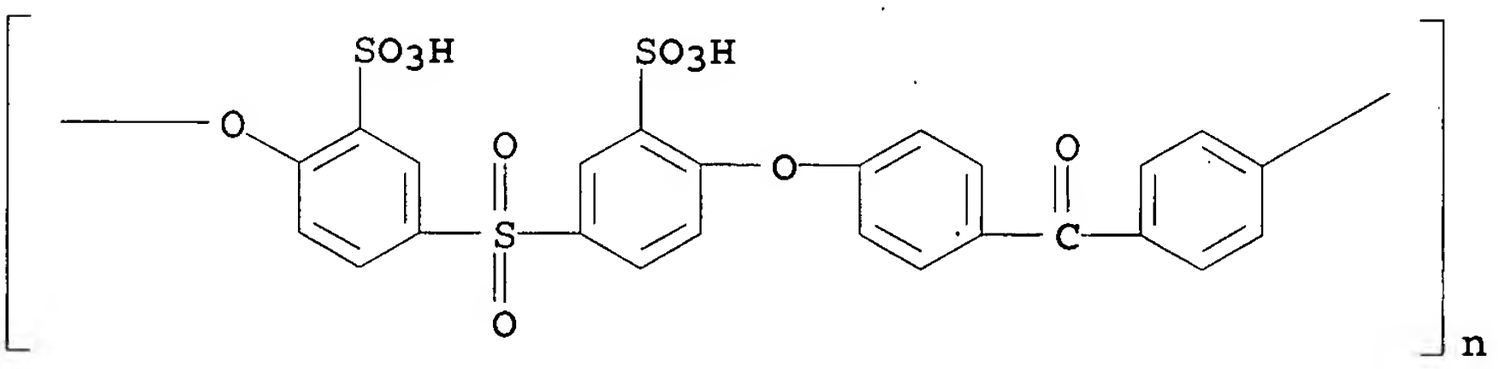
RN 753421-07-7 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene(1-methylethylidene)-1,4-phenylene] (9CI) (CA INDEX NAME)



RN 912548-38-0 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylenesulfonyl-1,4-phenylene] (9CI) (CA INDEX NAME)

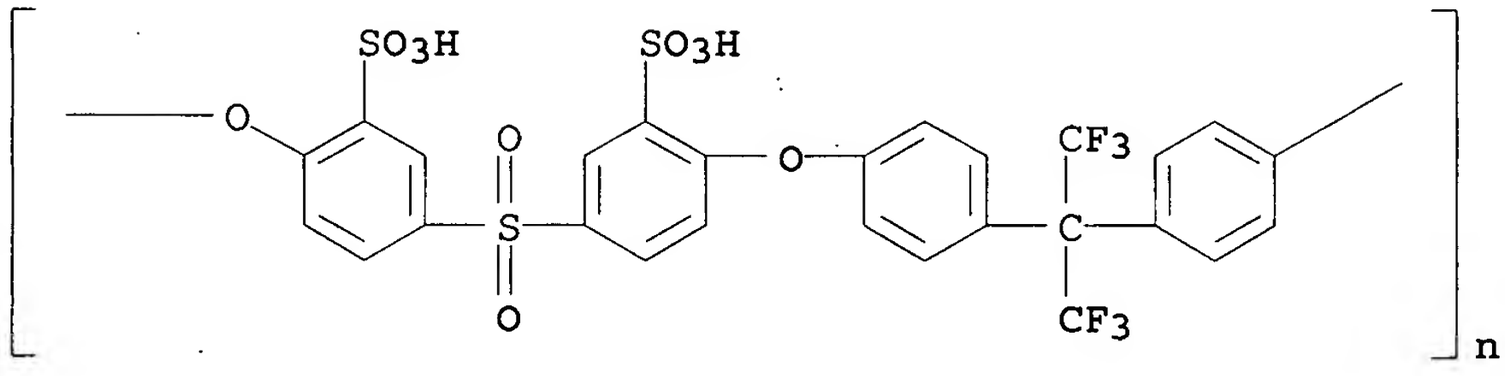


RN 912548-40-4 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylenecarbonyl-1,4-phenylene] (9CI) (CA INDEX NAME)

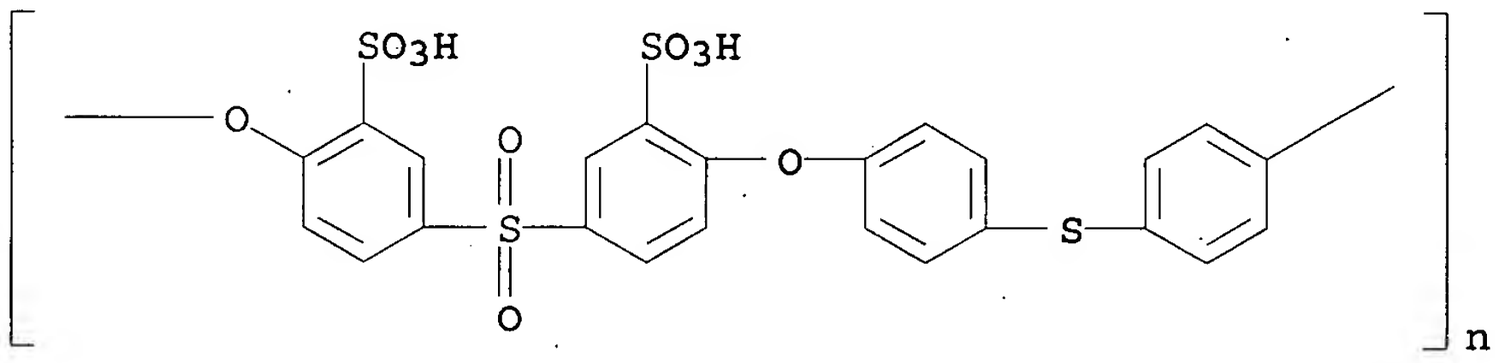


RN 912548-43-7 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-

phenylene] (9CI) (CA INDEX NAME)



RN 912548-45-9 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylenethio-1,4-phenylene] (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
IT **751480-76-9P 753421-07-7P 912548-38-0P**
912548-40-4P 912548-43-7P 912548-45-9P
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(proton-conductive sulfonated polyethersulfones having high resistance against radical attack for fuel cell electrolytes)

L19 ANSWER 7 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:887301 HCAPLUS
DOCUMENT NUMBER: 146:482319
TITLE: Synthesis of multiblock copolymers based on sulfonated segmented hydrophilic-hydrophobic blocks for proton exchange membranes
AUTHOR(S): Lee, Hae-Seung; Roy, Abhishek; Badami, Anand S.; McGrath, James E.
CORPORATE SOURCE: Macromolecules and Interfaces Institute, Department of Chemistry, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: PMSE Preprints (2006), 95, 210-211
CODEN: PPMRA9; ISSN: 1550-6703
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
AB Controlled mol. weight hydrophilic and hydrophobic blocks with primary amine and anhydride end groups were successfully synthesized. A series of segmented sulfonated poly(arylene ether)-B-polyimide multiblock copolymers having various block lengths were synthesized via coupling reaction between amine moieties on hydrophilic blocks

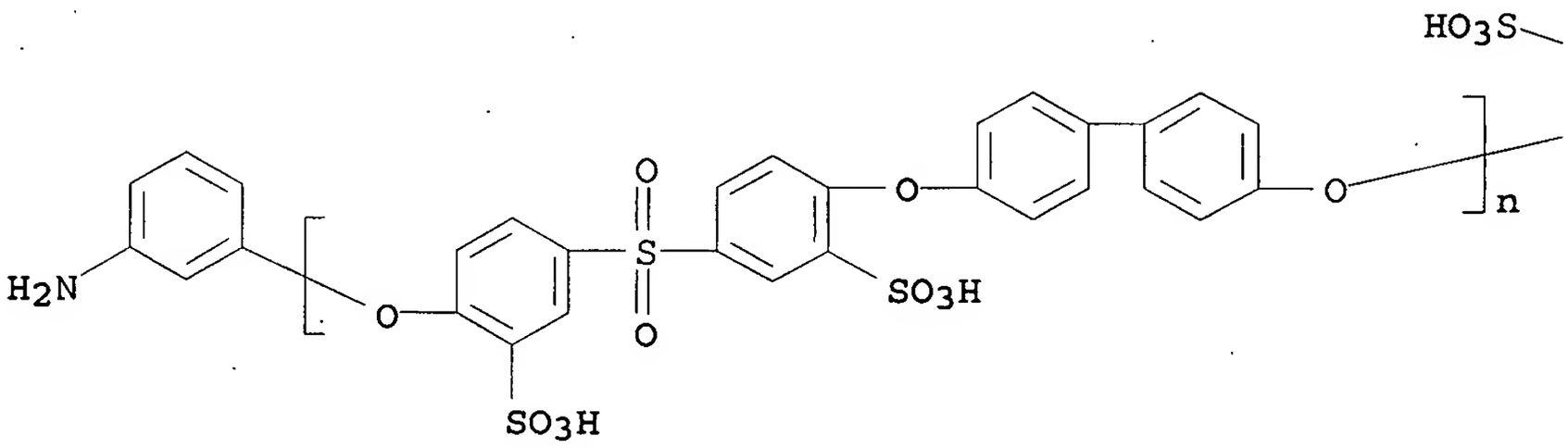
and anhydride moieties on hydrophobic blocks. Successful imidization reactions require an NMP + m-cresol mixed solvent system and catalysis was essential. All copolymers give tough, ductile films when cast with a NMP solution Several membrane parameters were investigated e.g. water uptake, proton conductivity, and methanol permeability. The new materials are strong candidates for PEM systems.

IT **936028-30-7DP**, potassium exchanged
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(synthesis of multiblock copolymers based on sulfonated segmented hydrophilic-hydrophobic blocks for proton exchange membranes)

RN 936028-30-7 HCAPLUS

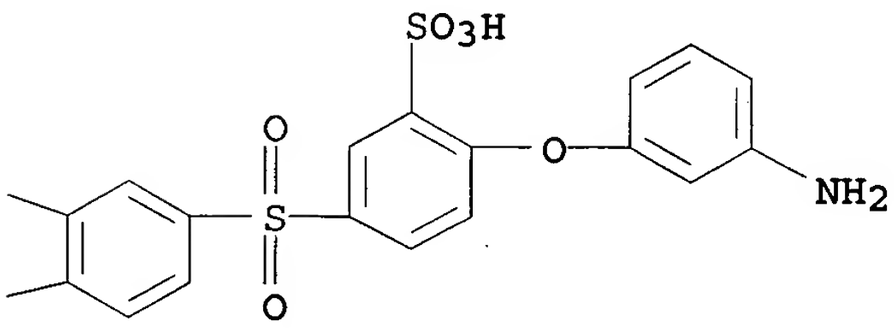
CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy sodium salt (1:2)], α-[4-[[4-(3-aminophenoxy)-3-sulfophenyl]sulfonyl]-2-sulfophenyl]-ω-(3-aminophenyl)-, sodium salt (1:2) (CA INDEX NAME)

PAGE 1-A



●4 Na

PAGE 1-B



CC 35-5 (Chemistry of Synthetic High Polymers)

IT 389600-31-1DP, aminophenyl-terminated, potassium-exchanged
936028-30-7DP, potassium exchanged 936028-31-8P
936028-33-0P

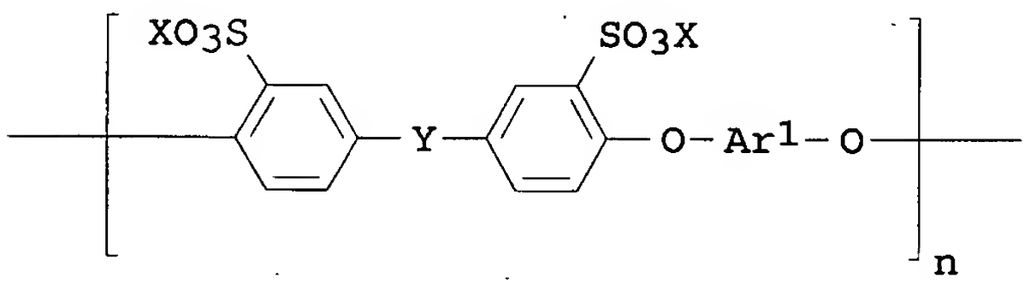
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(synthesis of multiblock copolymers based on sulfonated segmented hydrophilic-hydrophobic blocks for proton exchange membranes)
REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 8 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:652947 HCAPLUS
DOCUMENT NUMBER: 145:127532
TITLE: Sulfo-containing polyether segmented block copolymers, their compositions and forms, and fuel cells with proton-exchange membranes comprising same polymers
INVENTOR(S): Kitamura, Kota; Sakaguchi, Yoshimitsu
PATENT ASSIGNEE(S): Toyobo Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 37 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

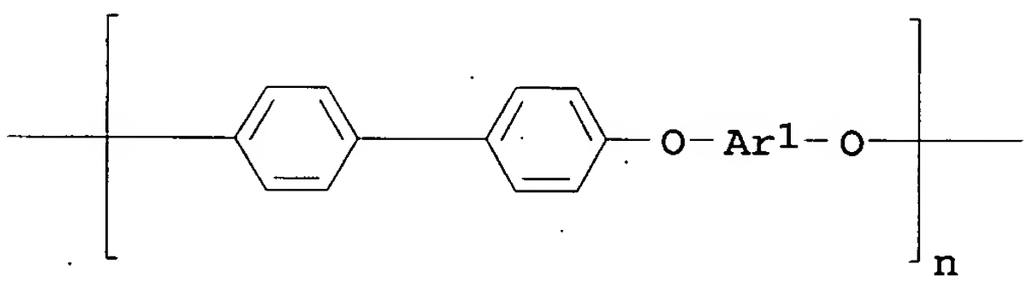
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006176666	A	20060706	JP 2004-371769	20041222

PRIORITY APPLN. INFO.: JP 2004-371769 20041222

GI



I



II

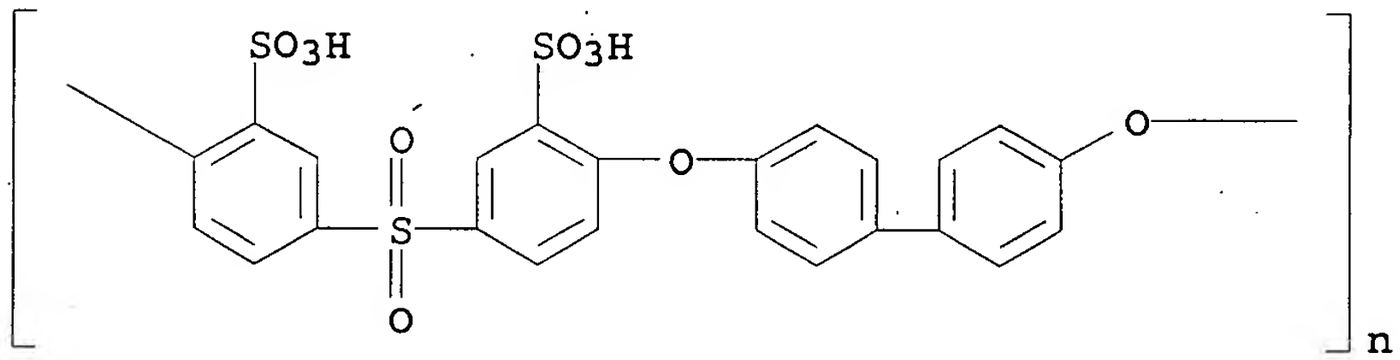
AB The block copolymers are mainly constituted by (A) sulfo-bearing polyether first segments expressed by the formula I (X = H,

monovalent cation; Y = sulfonyl, carbonyl; Ar1 = divalent aromatic group; n = 3-50), and (B) polyether second segments expressed by II (Ar2 = divalent aromatic group bearing electron-withdrawing groups; m = 3-50). Proton-exchange membranes containing the polymers show high stability in high-temperature (at .apprx.200°) high-moist environment, and high H+ conductivity

IT **701915-80-2P**, 3,3'-Disulfo-4,4'-dichlorodiphenylsulfone disodium salt-4,4'-bisphenol copolymer, sru
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(preparation and reaction of; sulfo-containing polyether segmented block copolymers for fuel cell proton-exchange membrane electrolytes)

RN 701915-80-2 HCAPLUS

CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) sodium salt (1:2)] (CA INDEX NAME)



●2 Na

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

IT 25608-64-4P, 4,4'-Biphenol-4,4'-Dichlorodiphenylsulfone copolymer
25839-81-0P, 4,4'-Biphenol-4,4'-Dichlorodiphenylsulfone copolymer, sru 389600-31-1P, 3,3'-Disulfo-4,4'-dichlorodiphenylsulfone disodium salt-4,4'-bisphenol copolymer **701915-80-2P**, 3,3'-Disulfo-4,4'-dichlorodiphenylsulfone disodium salt-4,4'-bisphenol copolymer, sru
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(preparation and reaction of; sulfo-containing polyether segmented block copolymers for fuel cell proton-exchange membrane electrolytes)

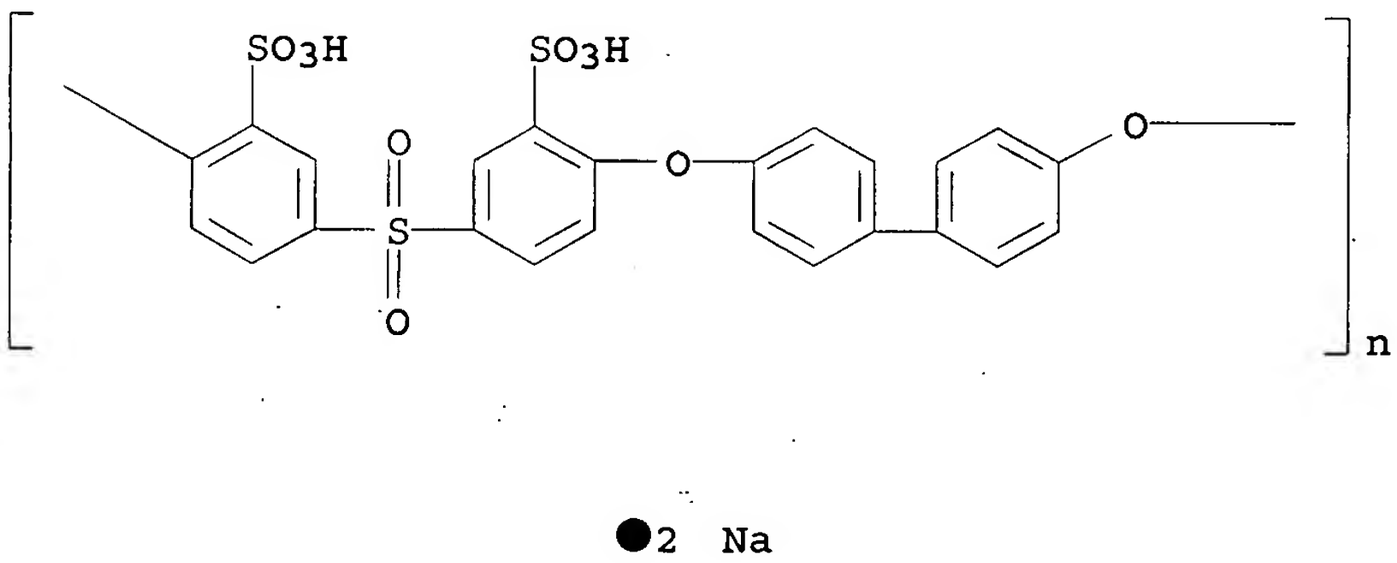
L19 ANSWER 9 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:529658 HCAPLUS
DOCUMENT NUMBER: 145:214193
TITLE: Multiblock sulfonated-fluorinated poly(arylene ether)s for a proton exchange membrane fuel cell
AUTHOR(S): Ghassemi, Hossein; McGrath, James E.; Zawodzinski, Thomas A.
CORPORATE SOURCE: Department of Chemical Engineering, Case Western Reserve University, Cleveland, OH, 44106, USA
SOURCE: Polymer (2006), 47(11), 4132-4139
CODEN: POLMAG; ISSN: 0032-3861
PUBLISHER: Elsevier Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB New p exchange membranes were prepared and evaluated as polymer

electrolytes for a p exchange membrane fuel cell.
Sulfonated-fluorinated poly(arylene ether) multiblocks (MBs) were synthesized by nucleophilic aromatic substitution of highly activated F-terminated telechelics made from decafluorobiphenyl with 4,4'-(hexafluoroisopropylidene)diphenol and hydroxyl-terminated telechelics made from 4,4'-biphenol and 3,3'-disulfonated-4,4'-dichlorodiphenylsulfone. Membranes with various sulfonation levels were cast from N-methyl-2-pyrrolidinone. An increase sulfonated block size in the copolymer resulted in enhanced membrane ion exchange capacity and p conductivity The morphol. structure of MB copolymers was studied by tapping mode AFM and compared with those of Nafion and sulfonated poly(arylene ether) random copolymers. AFM images of MBs revealed well-defined phase separation which may explain their higher p conductivities compared to the random copolymers.
The results are of interest for H/air fuel cells where conductivity at high temperature and low relative humidity is a critical issue.

IT **701915-80-2P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(in synthesis of multiblock sulfonated-fluorinated poly(arylene ether)s for proton exchange membrane fuel cells)

RN 701915-80-2 HCAPLUS
CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) sodium salt (1:2)] (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35, 38

IT 136835-79-5P 136835-79-5P 136875-49-5P **701915-80-2P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(in synthesis of multiblock sulfonated-fluorinated poly(arylene ether)s for proton exchange membrane fuel cells)

REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 10 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:301633 HCAPLUS
DOCUMENT NUMBER: 144:334262
TITLE: Electrolyte composition, solid electrolyte membrane and solid polymer fuel cell
INVENTOR(S): Yoshino, Makoto; Cooray, Nawalage Florence; Takei, Fumio
PATENT ASSIGNEE(S): Fujitsu Limited, Japan

SOURCE: U.S. Pat. Appl. Publ., 8 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006068254	A1	20060330	US 2005-145213	20050606
JP 2006100058	A	20060413	JP 2004-283223	20040929

PRIORITY APPLN. INFO.: JP 2004-283223 A 20040929

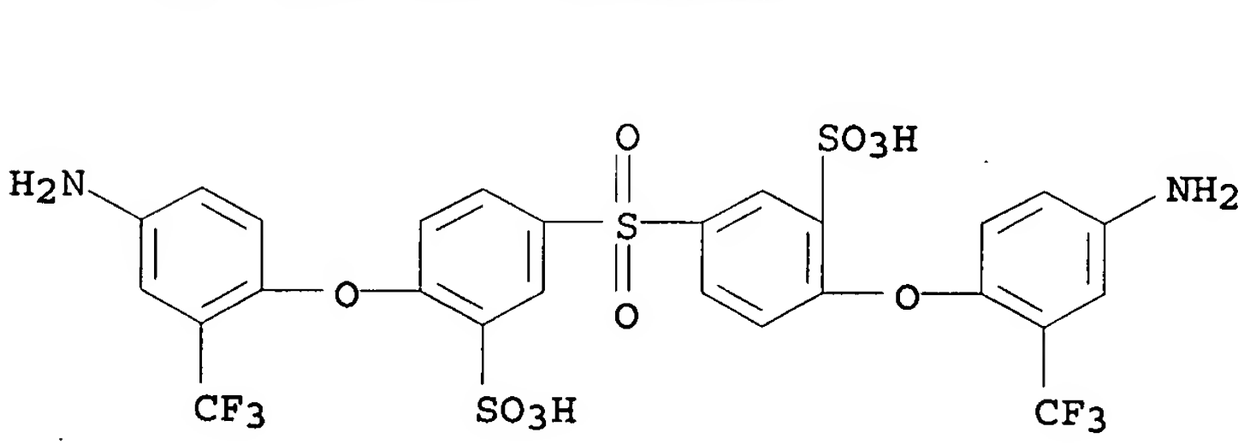
AB A novel electrolyte composition is provided for obtaining a solid electrolyte membrane capable of exhibiting a large ion exchange capacity, high proton conductivity and a low methanol permeation coefficient This electrolyte composition contains a sulfonic acid group-containing polyimide and having a specific structure. Such a polyimide can be obtained, for example, by reacting 1,4,5,8-naphthalenetetracarboxylic dianhydride with a diamine compound

IT **880872-94-6P**
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(electrolyte composition, solid electrolyte membrane and solid polymer fuel cell)

RN 880872-94-6 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-[4-amino-2-(trifluoromethyl)phenoxy]-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone (9CI) (CA INDEX NAME)

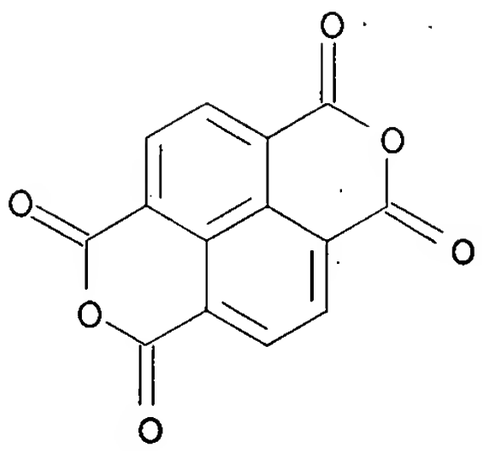
CM 1

CRN 880872-93-5
CMF C26 H18 F6 N2 O10 S3



CM 2

CRN 81-30-1
CMF C14 H4 O6



INCL 429033000; 429314000; 429316000; 429317000; 521025000; 521027000; 427115000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
IT **880872-94-6P**
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(electrolyte composition, solid electrolyte membrane and solid polymer fuel cell)

L19 ANSWER 11 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:844157 HCAPLUS
DOCUMENT NUMBER: 144:394394
TITLE: Synthesis and characterization of segmented sulfonated poly(arylene ether)-B-polyimide copolymers as proton exchange membranes
AUTHOR(S): Lee, Hae-Seung; Einsla, Brian; McGrath, James E.
CORPORATE SOURCE: Department of Chemistry and Macromolecules and Interfaces Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry (2005), 50(2), 579-580
CODEN: PSADFZ; ISSN: 1521-4648
PUBLISHER: American Chemical Society, Division of Fuel Chemistry
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English

AB Multi phase segmented sulfonated poly(arylene ether)-B-polyimide block copolymer systems may afford higher hydrolytic stability under acidic conditions than similar materials without the polyimide part of the blocks. The polyimide portion of the membrane allows for good mech. properties and low fuel permeability and the sulfonated poly(arylene ether) permits the transport of protons by specific water transport mechanism. This paper describes the synthesis and properties of the polyarylene ether polysulfone blocks which will eventually be included into sulfonated polynaphthalenediimide copolymers with controlled mol. weight The mol. wts. and intrinsic viscosity were measured for 4 copolymers. Methanol permeability and proton conductivity of several polyimide-polysulfone-polyether polymers and some Nafion membranes were also measured.

IT **676474-37-6**
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(BAPS structures; synthesis and characterization of controlled mol. weight segments of sulfonated poly(arylene ether)-polyimide

block copolymers as proton exchange membranes)

RN 676474-37-6 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-[sulfonylbis(4,1-phenyleneoxy)]bis[benzenamine] (9CI) (CA INDEX NAME)

CM 1

CRN 30203-11-3
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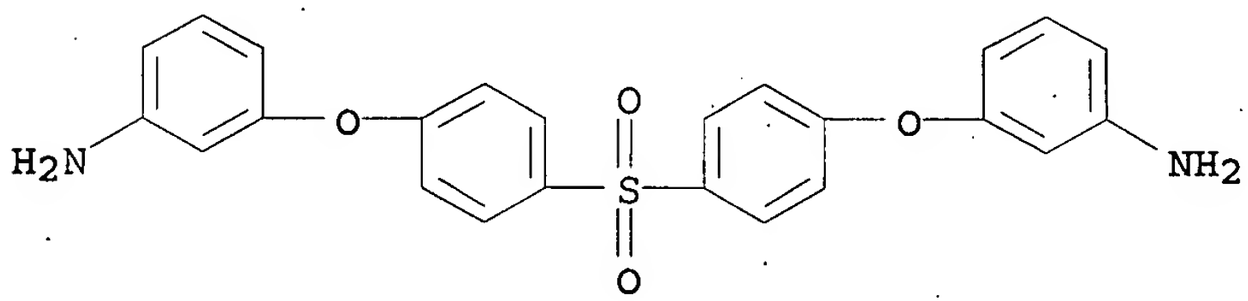
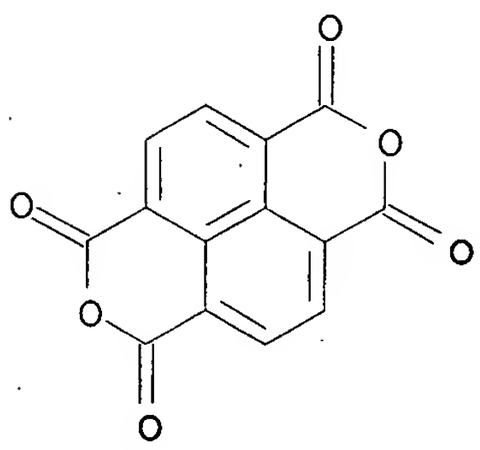


CM 2

CRN 81-30-1
CMF C14 H4 O6

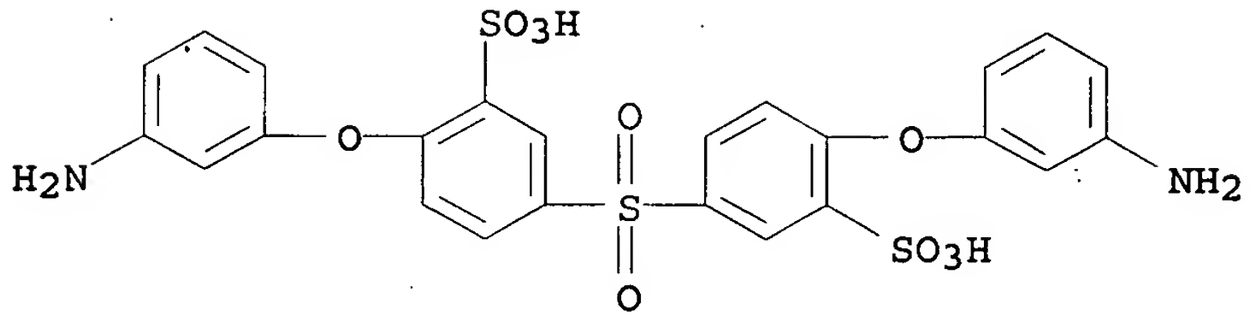


CM 3

CRN 676474-36-5
CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

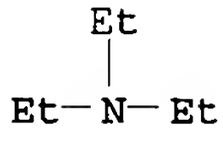
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

CRN 121-44-8
CMF C6 H15 N



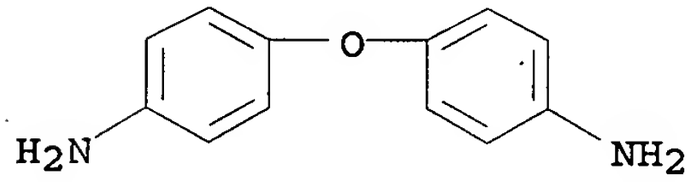
IT **676474-38-7**
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(ODA structures; synthesis and characterization of controlled mol. weight segments of sulfonated poly(arylene ether)-polyimide block copolymers as proton exchange membranes)

RN 676474-38-7 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 4,4'-oxybis[benzenamine] (9CI) (CA INDEX NAME)

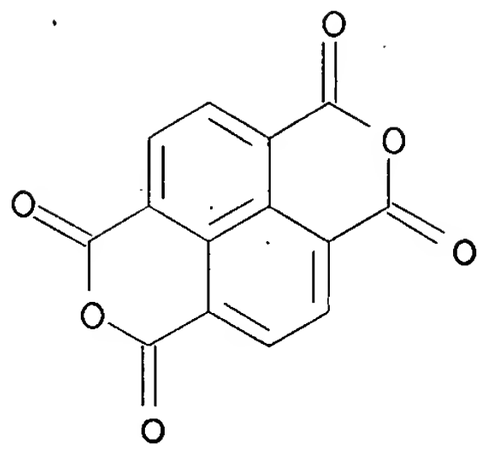
CM 1

CRN 101-80-4
CMF C12 H12 N2 O



CM 2

CRN 81-30-1
CMF C14 H4 O6

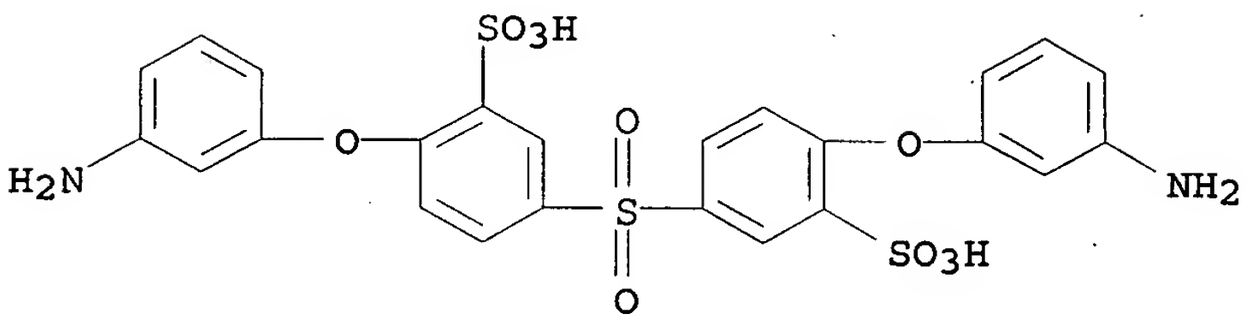


CM 3

CRN 676474-36-5
CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

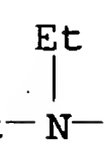
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

CRN 121-44-8
CMF C6 H15 N



Et—N—Et

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35, 36

IT **676474-37-6**
RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)
(BAPS structures; synthesis and characterization of controlled mol. weight segments of sulfonated poly(arylene ether)-polyimide block copolymers as proton exchange membranes)

IT **676474-38-7**
RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)
(ODA structures; synthesis and characterization of controlled mol. weight segments of sulfonated poly(arylene ether)-polyimide block copolymers as proton exchange membranes)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

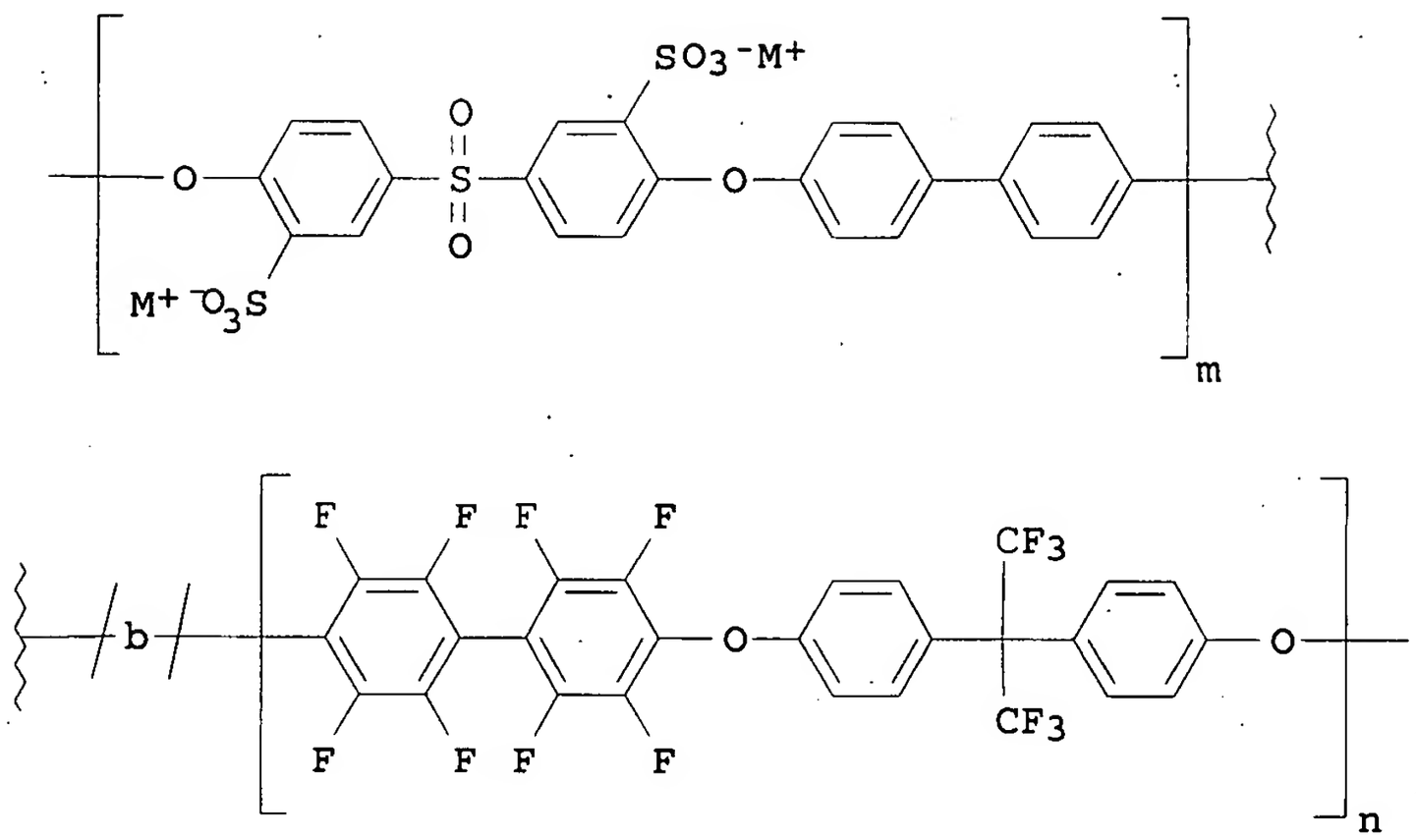
L19 ANSWER 12 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:493819 HCAPLUS
DOCUMENT NUMBER: 143:29508
TITLE: Multiblock copolymers containing hydrophilic-hydrophobic segments for proton exchange membrane fuel cells
INVENTOR(S): Harrison, William; Ghassemi, Hossein; Zawodzinski, Tom A., Jr.; McGrath, James E.
PATENT ASSIGNEE(S): Virginia Tech Intellectual Properties, Inc., USA
SOURCE: PCT Int. Appl., 25 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2005053060	A2	20050609	WO 2004-US38691	200411 19
WO 2005053060	A3	20051110		
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
CA 2545375	A1	20050609	CA 2004-2545375	200411 19
EP 1687377	A2	20060809	EP 2004-816962	200411 19
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, PL, SK, IS				
JP 2007515513	T	20070614	JP 2006-541369	200411 19

PRIORITY APPLN. INFO.:		
US 2003-523332P	P	200311 20
WO 2004-US38691	W	200411 19

GI

MHuang REM4B31 571-272-3952 09/06/2007



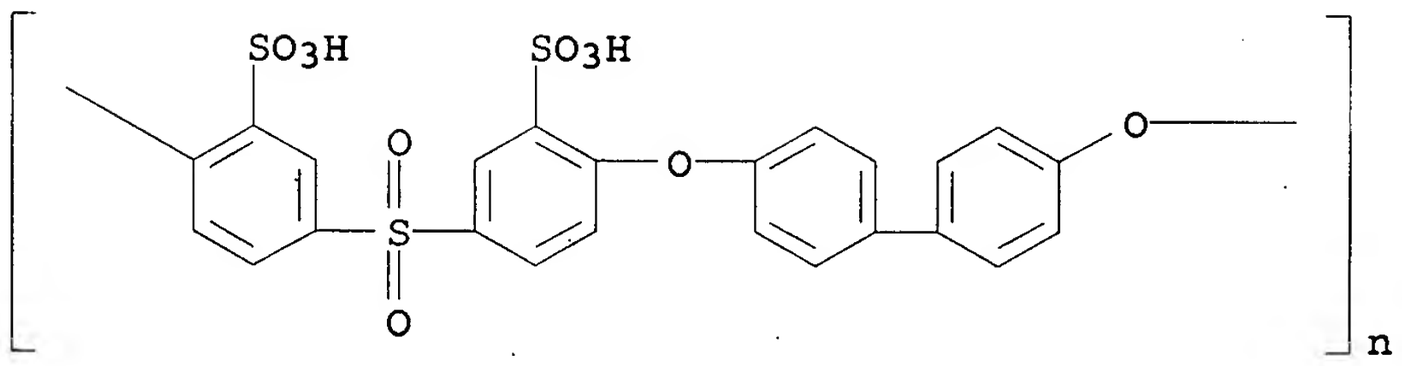
I

AB Novel multiblock copolymers containing perfluorinated poly(arylene ether) as a hydrophobic segment and disulfonated poly(arylene ether sulfone) as a hydrophilic segment are provided. A multiblock copolymer (I) is disclosed, where M+ is a pos. charged counterion selected from the group consisting of K, Na, and alkyl amine, m = 2-50, n = 2-30, and b represents connection of resp. blocks. The multiblock copolymers are used to form proton exchange membranes that are thermally and hydrolytically stable, flexible, and that exhibit low methanol permeability and high proton conductivity The proton exchange membranes are thus well-suited for use as polymer electrolytes in fuel cells.

IT **701915-80-2P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(multiblock copolymers containing hydrophilic-hydrophobic segments for proton exchange membrane fuel cells)

RN 701915-80-2 HCAPLUS

CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) sodium salt (1:2)] (CA INDEX NAME)



●2 Na

IC ICM H01M
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
IT 136835-79-5P 136875-49-5P 701915-79-9P **701915-80-2P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(multiblock copolymers containing hydrophilic-hydrophobic segments for proton exchange membrane fuel cells)

L19 ANSWER 13 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:411880 HCAPLUS
DOCUMENT NUMBER: 143:117951
TITLE: Sulfonated naphthalene dianhydride based polyimide copolymers for proton-exchange-membrane fuel cells. II. Membrane properties and fuel cell performance
AUTHOR(S): Einsla, Brian R.; Kim, Yu Seung; Hickner, Michael A.; Hong, Young-Taik; Hill, Melinda L.; Pivovar, Bryan S.; McGrath, James E.
CORPORATE SOURCE: Macromolecules and Interfaces Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Journal of Membrane Science (2005), 255(1-2), 141-148
CODEN: JMESDO; ISSN: 0376-7388
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Selected properties of two series of sulfonated naphthalene dianhydride based polyimide copolymers were studied to assess their potential for fuel cell applications. The copolyimides were synthesized in m-cresol from a novel disulfonated diamine 3,3'-disulfonic acid-bis[4-(3-aminophenoxy)phenyl]sulfone (SA-DADPS), 1,4,5,8-naphthalenetetracarboxylic dianhydride (NDA), and one of two nonsulfonated diamines (4,4'-oxydianiline (ODA) or bis[4-(3-aminophenoxy)phenyl] sulfone (m-BAPS)). Both systems produced tough, ductile cast films. The membrane parameters studied include water sorption, proton conductivity, water stability, methanol permeability and direct methanol fuel cell (DMFC) performance. The mol. structure of the nonsulfonated diamine significantly influenced the hydrolytic stability of the membrane in water at 80°C. However, the water sorption and proton conductivity were primarily a function of the ion exchange capacity (IEC) and were independent of the structure of the nonsulfonated diamine. The copolyimide membranes using m-BAPS as the nonsulfonated diamine displayed the best water stability at 80°. Unfortunately, the best

hydrolytic stability achieved was still much lower than Nafion or analogous poly(arylene ether)s. At relatively high ion exchange capacities, the proton conductivities of the polyimides in water at 30 °C were equivalent to Nafion 1135. An IEC of .apprx.1.9 (BAPS-80, ODA-70) was necessary to provide conductivities close to 0.1 S/cm in water at 30°C. The proton conductivity of the membranes increased at elevated temperature and high relative humidity. The initial DMFC performance of several copolyimides was studied, and these membranes had much lower methanol permeability and performed comparably to Nafion 117 over short-term testing at 80°C.

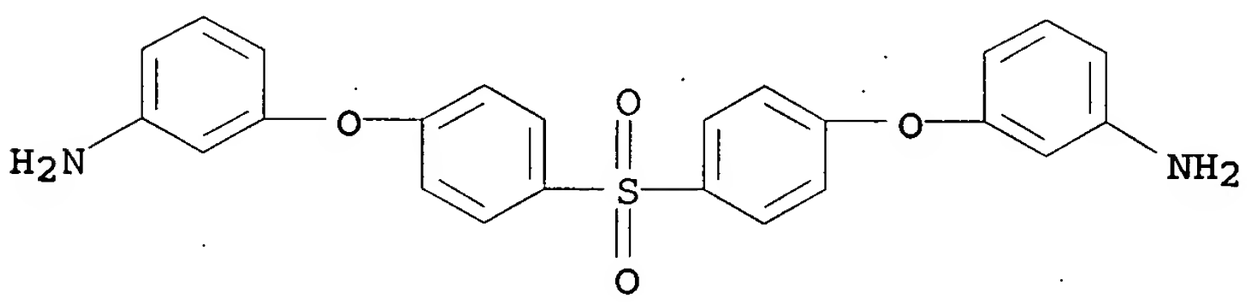
IT **676474-37-6P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(BAPS-XX; membrane properties and proton-exchange-membrane fuel cell performance of sulfonated naphthalene dianhydride based polyimide copolymers)

RN 676474-37-6 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-[sulfonylbis(4,1-phenyleneoxy)]bis[benzenamine] (9CI) (CA INDEX NAME)

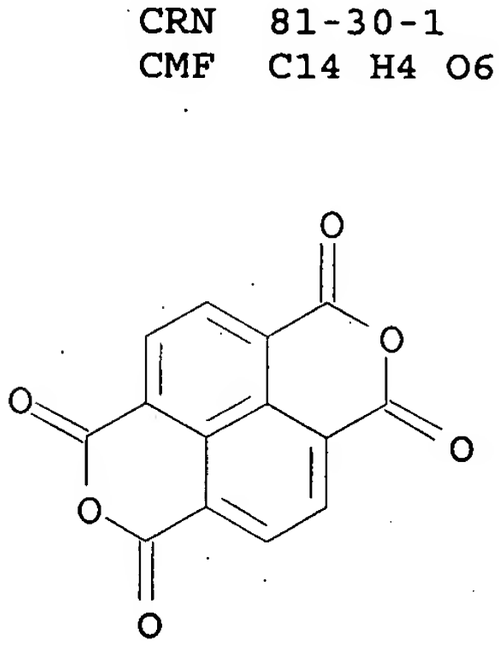
CM 1

CRN 30203-11-3
CMF C24 H20 N2 O4 S



CM 2

CRN 81-30-1
CMF C14 H4 O6



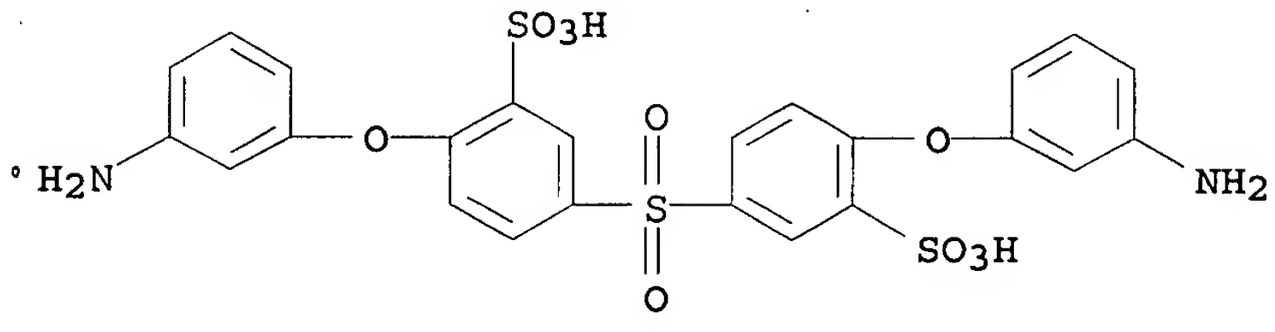
CM 3

CRN 676474-36-5

CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

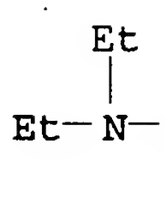
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

CRN 121-44-8
CMF C6 H15 N



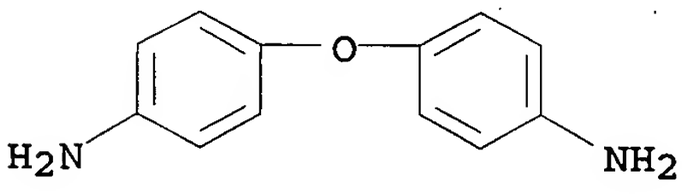
IT **676474-38-7P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(ODA-XX; membrane properties and proton-exchange-membrane fuel cell performance of sulfonated naphthalene dianhydride based polyimide copolymers)

RN 676474-38-7 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 4,4'-oxybis[benzenamine] (9CI) (CA INDEX NAME)

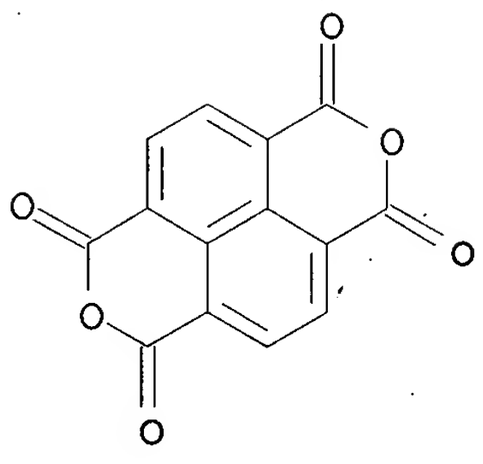
CM 1

CRN 101-80-4
CMF C12 H12 N2 O



CM 2

CRN 81-30-1
CMF C14 H4 O6

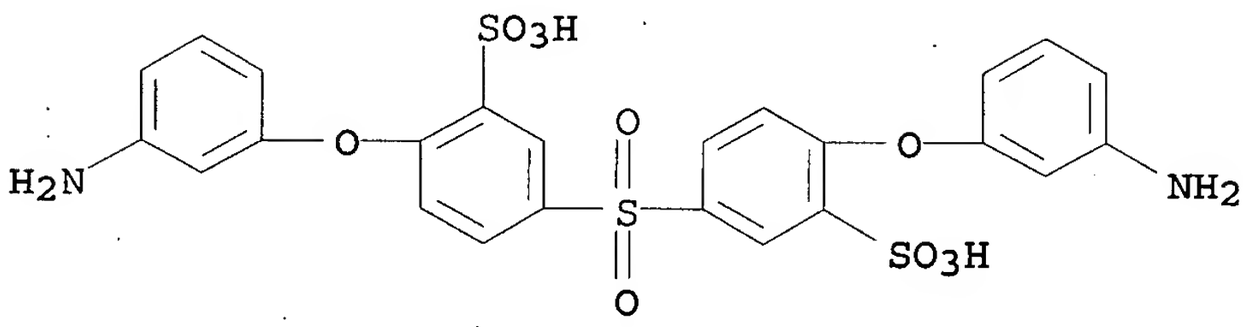


CM 3

CRN 676474-36-5
CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

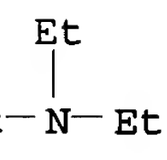
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

CRN 121-44-8
CMF C6 H15 N



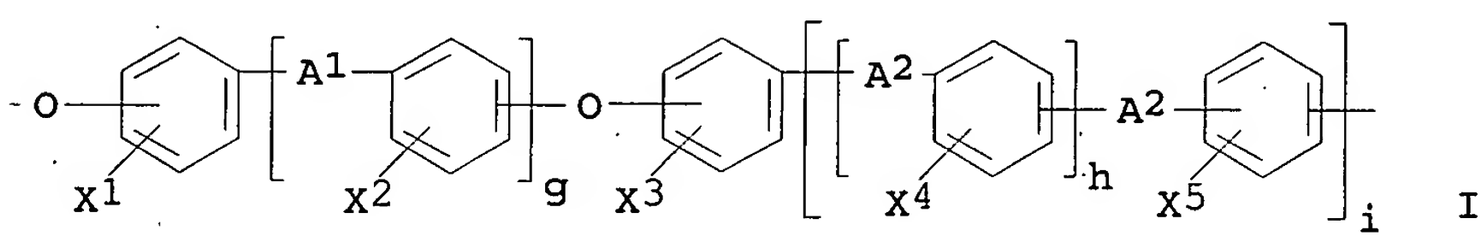
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 36, 38, 76
IT **676474-37-6P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(BAPS-XX; membrane properties and proton-exchange-membrane fuel cell performance of sulfonated naphthalene dianhydride based polyimide copolymers)
IT **676474-38-7P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(ODA-XX; membrane properties and proton-exchange-membrane fuel cell performance of sulfonated naphthalene dianhydride based polyimide copolymers)
REFERENCE COUNT: 41 THERE ARE 41 CITED REFERENCES AVAILABLE

FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

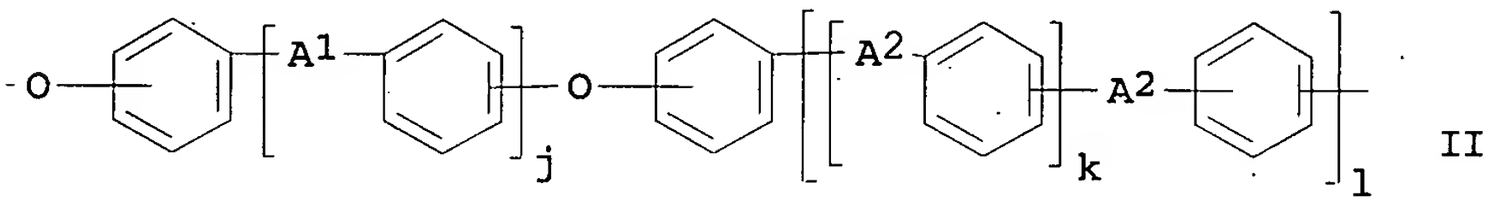
L19 ANSWER 14 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:1128721 HCAPLUS
DOCUMENT NUMBER: 142:77601
TITLE: Proton conductive block-copolymers with good water resistance and low moisture absorption and low methanol penetration for proton conductive membranes
INVENTOR(S): Ishikawa, Junichi; Omi, Katsuhiko; Fujiyama, Akiko; Toriida, Masahiro; Takeda, Koji; Kuroki, Takashi; Tamai, Masashi
PATENT ASSIGNEE(S): Mitsui Chemicals Inc., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 19 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004359925	A	20041224	JP 2003-207951	20030819
PRIORITY APPLN. INFO.:			JP 2003-102682 A	20030407

GI



I



II

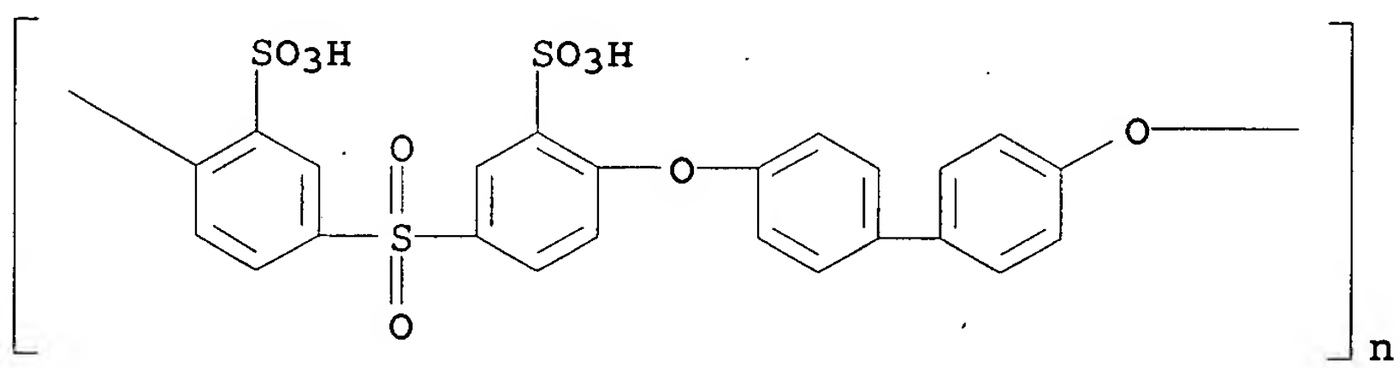
AB Title block copolymers comprise repeating unit blocks I and II, wherein X1, X2, X3, X4, X5 = H or protonic acid group (at least one of them is a protonic acid group); A1, A2, A3, A4 = direct bond, CH2, C(CH3)2, C(CF3)2, O, SO2, or CO; or g, h, i, j, k, l = 0 or 1; hydrogen of the aromatic ring = H, CmH2m+1, Cl, F, CF3, or CN; and m = 1-10 integer. Thus, 42.23 g 3,3'-carbonylbis(sodium 6-fluorobenzenesulfonate) and 25.63 g bis(3-methyl-4-hydroxyphenyl)methane were reacted at 141° for 8 h to give a copolymer with reduced viscosity 0.13 dL/g and glass transition temperature ≥250°, 21.82 g 4,4'-difluorobenzophenone and

25.63 g bis(3-methyl-4-hydroxyphenyl)methane were added therein and reacted at 157° for 8 h to give a block copolymer with reduced viscosity 1.21 dL/g and glass transition temperature 220°, 4 g of the resulting block copolymer was dissolved in 36 g DMSO/dimethylacetamide mixture, cast onto a glass substrate, dried at 200°, washed, and proton-exchanged with sulfuric acid to give a proton conductive film with ion exchange capacity 510 g/mol, moisture absorption 12%, ion conductivity 0.14 S/cm, and methanol permeability 0.4 μmol/cm2·minute.

IT **701915-80-2P**
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(intermediate; preparation of proton conductive block-copolymers with good water resistance, low moisture absorption, and low methanol penetration for proton conductive membranes)

RN 701915-80-2 HCAPLUS

CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) sodium salt (1:2)] (CA INDEX NAME)



●2 Na

IC ICM C08G065-48
ICS C08J005-22; H01M008-02; H01M008-10; C08L071-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

IT 389600-31-1P **701915-80-2P** 785802-31-5P 812669-30-0P
812669-39-9P 812669-44-6P 812669-47-9P 812669-50-4P
812669-55-9P 812677-79-5P
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(intermediate; preparation of proton conductive block-copolymers with good water resistance, low moisture absorption, and low methanol penetration for proton conductive membranes)

L19 ANSWER 15 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:1042268 HCAPLUS
DOCUMENT NUMBER: 143:194565
TITLE: Novel proton conducting polyimides from sulfonated sulfonyl-containing diamine monomer
AUTHOR(S): Guo, Xiaoxia; Fang, Jianhua; Okamoto, Ken-ichi
CORPORATE SOURCE: School of Chemistry and Chemical Technology, Shanghai Jiao Tong University, Shanghai, 200240, Peop. Rep. China
SOURCE: Transactions of the Materials Research Society of Japan (2004), 29(6), 2579-2582
CODEN: TMRJE3; ISSN: 1382-3469

PUBLISHER: Materials Research Society of Japan
DOCUMENT TYPE: Journal
LANGUAGE: English

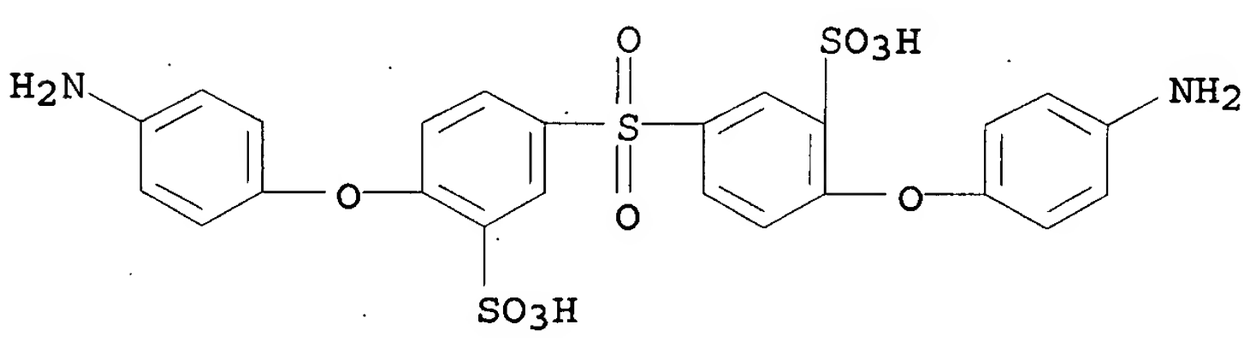
AB A novel sulfonated diamine monomer, 4,4'-bis(4-aminophenoxy)diphenyl sulfone-3,3'-disulfonic acid (BAPPSDS), was synthesized via two-step reactions. A series of sulfonated (co)polyimides with controlled sulfonation degrees were prepared from NTDA, BAPPSDS, and common nonsulfonated diamines. The homopolyimide NTDA-BAPPSDS was insol. in common organic solvents, whereas the copolyimides could be dissolved in m-cresol and dimethylsulfoxide (DMSO) when a proper nonsulfonated diamine was used. Water uptakes, proton conductivities, water stability and methanol permeability of these copolyimide membranes were investigated and compared with those of other sulfonated diamine-based ones. Polyimide membranes with good proton conductivity as well as good water stability were developed.

IT **500907-46-0P 861882-57-7P 861882-58-8P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation and characterization of proton-conducting polyimides from sulfonated sulfonyl-containing diamine monomers and their membrane performance)

RN 500907-46-0 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(4-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-dimethyl[1,1'-biphenyl]-4,4'-diamine (9CI) (CA INDEX NAME)

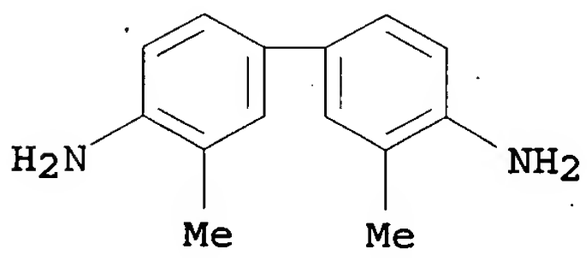
CM 1

CRN 500295-70-5
CMF C24 H20 N2 O10 S3



CM 2

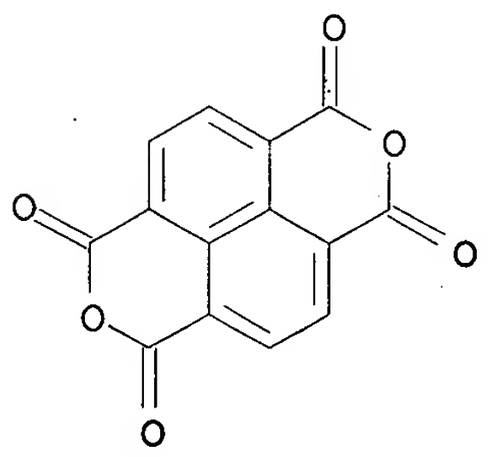
CRN 119-93-7
CMF C14 H16 N2



CM 3

CRN 81-30-1

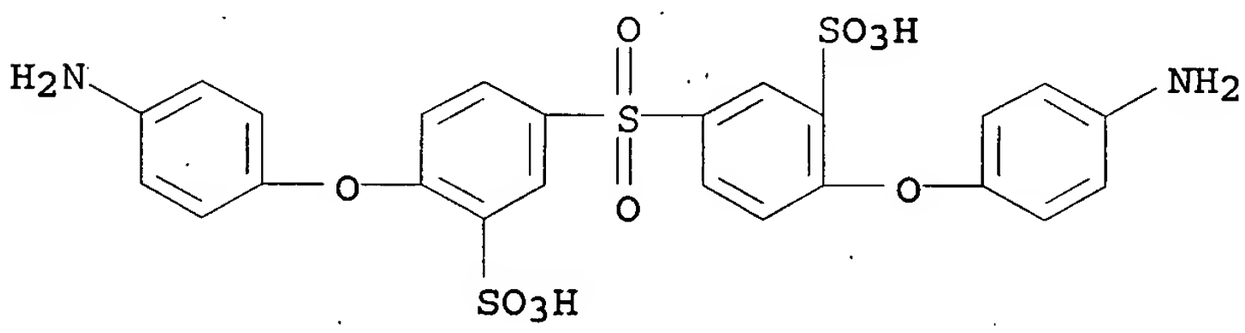
CMF C14 H4 O6



RN 861882-57-7 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(4-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-[sulfonylbis(4,1-phenyleneoxy)]bis[benzenamine] (9CI) (CA INDEX NAME)

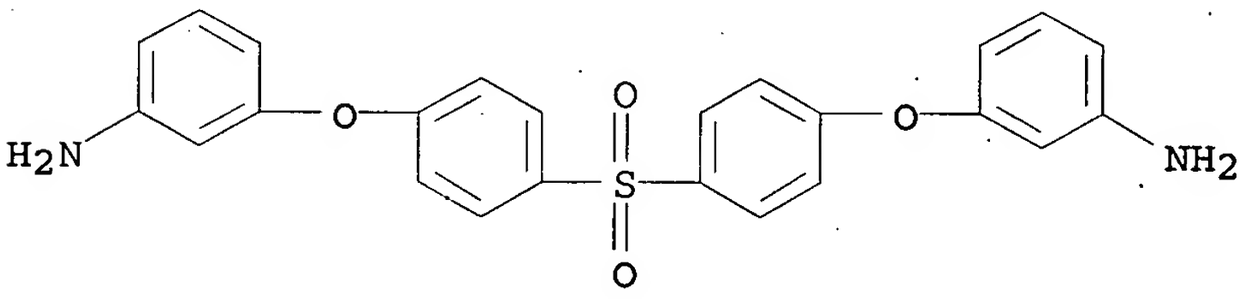
CM 1

CRN 500295-70-5
CMF C24 H20 N2 O10 S3



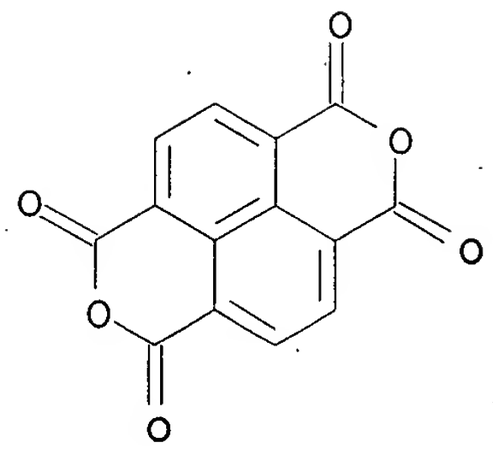
CM 2

CRN 30203-11-3
CMF C24 H20 N2 O4 S



CM 3

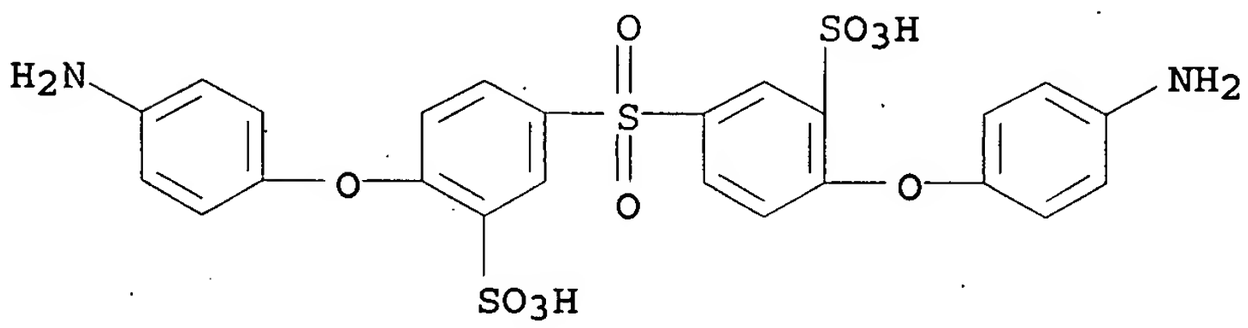
CRN 81-30-1
CMF C14 H4 O6



RN 861882-58-8 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(4-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 4,4'-[(1-methylethylidene)bis(4,1-phenyleneoxy)]bis[benzenamine] (9CI) (CA INDEX NAME)

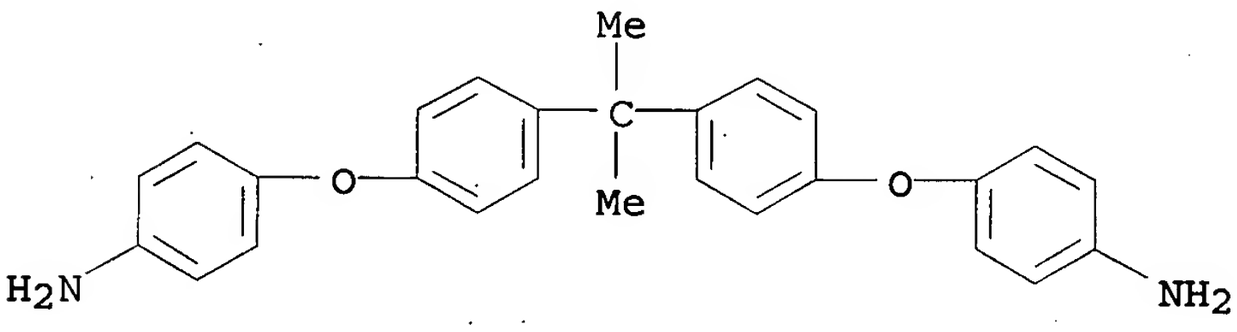
CM 1

CRN 500295-70-5
CMF C24 H20 N2 O10 S3



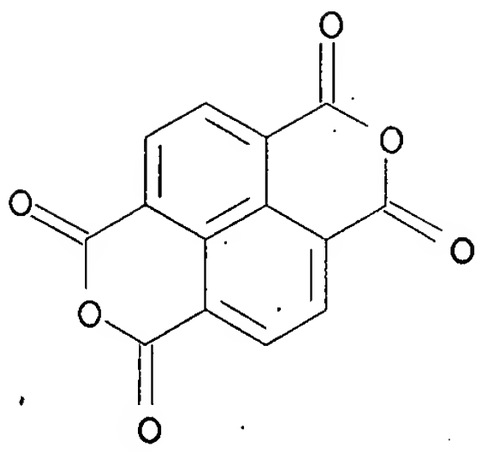
CM 2

CRN 13080-86-9
CMF C27 H26 N2 O2



CM 3

CRN 81-30-1
CMF C14 H4 O6



CC 37-3 (Plastics Manufacture and Processing)
Section cross-reference(s): 38
IT **500907-46-0P 861882-57-7P 861882-58-8P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation and characterization of proton-conducting polyimides from sulfonated sulfonyl-containing diamine monomers and their membrane performance)
REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

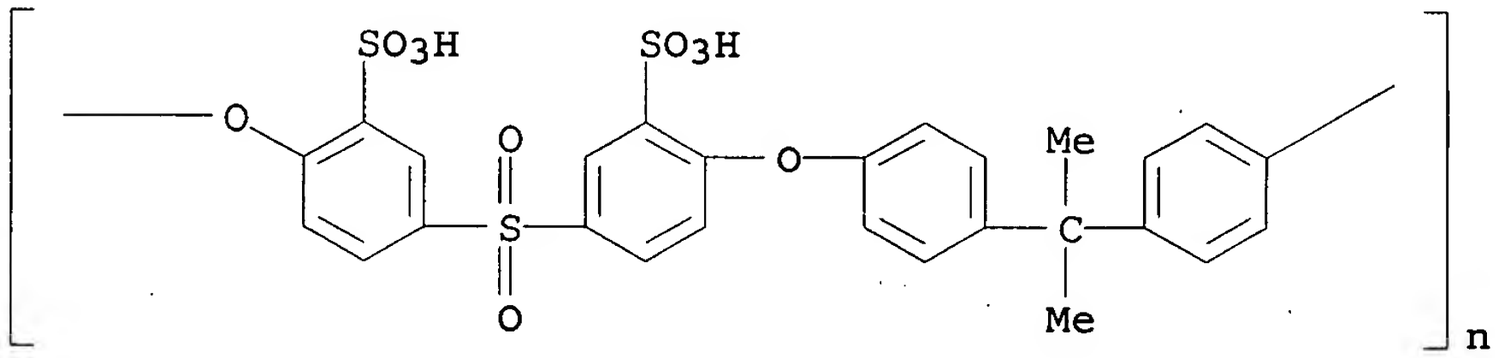
L19 ANSWER 16 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:921409 HCAPLUS
DOCUMENT NUMBER: 142:94932
TITLE: Acid functionalized poly(arylene ether)s for proton-conducting membranes
AUTHOR(S): Shin, Chong Kyu; Maier, Gerhard; Scherer, Guenther G.
CORPORATE SOURCE: Lehrstuhl fuer Makromolekulare Stoffe, Institut fuer Technische Chemie, Technische Universitaet Muenchen, Garching, D-85747, Germany
SOURCE: Journal of Membrane Science (2004), 245(1-2), 163-173
CODEN: JMESDO; ISSN: 0376-7388
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB 4,4'-Difluorobenzophenone and 4,4'-difluoro-diphenylsulfone were sulfonated successfully using fuming sulfuric acid (.apprx.50% SO3). These monomers and hydroquinone 2-potassium sulfonate were converted to poly(arylene ether)s by nucleophilic displacement polycondensation with different bisphenols in the presence of potassium carbonate in NMP or in DMSO. The polymers obtained by displacement exhibit high molar masses with weight average mol. wts. up to 1.84 + 105 g mol-1 in GPC. The chemical structures of the polymers were confirmed by spectroscopy and elemental anal. The resulting acid functionalized poly(arylene ether)s are amorphous with glass transition temps. between 175 and 248 °C, and the Tg's taken as maximum in the tan δ curve of the DMTA measurements are in good agreement with calorimetry results. The acid functionalized polymers exhibit acceptable thermal stability, i.e., a 5% weight loss occurred between 310 and 324 °C in TGA under synthetic air. The mech. properties of these polymers indicate ductile mech. behavior with an elongation at break up to 230%. Water uptakes of films cast from the polymers are between 39 and 49% (weight/weight), which corresponds to 8.8-10.0 mols. of H2O per sulfonic

acid group. Ion exchange capacity was also determined by titration

IT **816418-14-1P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation and mech. and thermal properties of acid functionalized poly(arylene ether)s for proton-conducting membranes)

RN 816418-14-1 HCAPLUS

CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene(1-methylethylidene)-1,4-phenylene dipotassium salt] (9CI) (CA INDEX NAME)



●2 K

CC 38-3 (Plastics Fabrication and Uses)

IT 25718-32-5P 25897-65-8P 29658-26-2P 31694-16-3P 41205-96-3P
60015-06-7P 100344-94-3P 105777-36-4P 109521-12-2P
121226-98-0P 123738-57-8P 125490-21-3P 197246-12-1P
197246-13-2P 197246-15-4P 197246-16-5P 816418-00-5P
816418-06-1P 816418-07-2P 816418-08-3P 816418-09-4P
816418-10-7P 816418-11-8P 816418-12-9P 816418-13-0P
816418-14-1P 816431-77-3P
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation and mech. and thermal properties of acid functionalized poly(arylene ether)s for proton-conducting membranes)

REFERENCE COUNT: 46 THERE ARE 46 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 17 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN

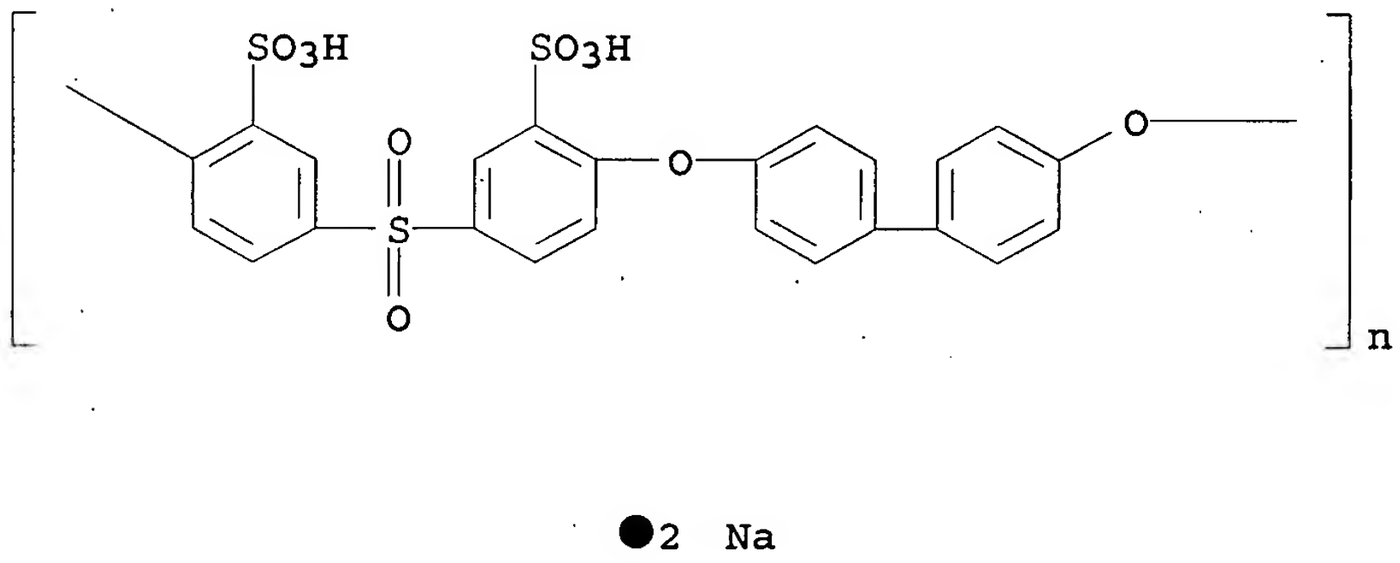
ACCESSION NUMBER: 2004:234147 HCAPLUS
DOCUMENT NUMBER: 141:38957
TITLE: New multiblock copolymers containing hydrophilic-hydrophobic segments for proton exchange membrane
AUTHOR(S): Ghassemi, Hossein; Harrison, William; Zawodzinski, Tom A., Jr.; McGrath, James E.
CORPORATE SOURCE: Department of Chemical Engineering, Case Western Reserve University, Cleveland, OH, 44106, USA
SOURCE: Polymer Preprints (American Chemical Society, Division of Polymer Chemistry) (2004), 45(1), 68-69
CODEN: ACPPAY; ISSN: 0032-3934
PUBLISHER: American Chemical Society, Division of Polymer Chemistry
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English

AB The synthesis and characterization of amphiphilic poly(arylene ether) copolymers of disulfonated a,w hydroxy terminated α,ω-fluoro terminated poly(arylene ether sulfone) and a,w terminated perfluorinated poly(arylene ether) were investigated. The degree of sulfonation of the final segmented polymers was controlled by varying the size of each block, which was measured by end group titration These multiblock copolymers were investigated by 1H-NMR and 19F-NMR and were further characterized by using DSC and TGA. The copolymers in the salt form were stable up to 500° under a nitrogen or air atmospheric by dynamic TGA. The multiblock copolymers with pendent sulfonic acid groups were soluble in polar solvents such as DMSO and afforded flexible and tough films via casting from solution The copolymers were somewhat hygroscopic and swelled in water. The proton conductivity values of the copolymers were measured by specific impedancce spectroscopy and ranged from 0.1-0.3 S/cm. Further characterization is in progress and will be reported.

IT **701915-80-2P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(multiblock copolymers containing hydrophilic-hydrophobic segments for proton exchange membrane)

RN 701915-80-2 HCAPLUS

CN Poly[oxy[1,1'-biphenyl]-4,4'-diyloxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) sodium salt (1:2)] (CA INDEX NAME)



CC 35-8 (Chemistry of Synthetic High Polymers)

IT 136835-79-5P 136875-49-5P 701915-79-9P **701915-80-2P**
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(multiblock copolymers containing hydrophilic-hydrophobic segments for proton exchange membrane)

REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 18 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:99185 HCAPLUS
DOCUMENT NUMBER: 140:304160
TITLE: Sulfonated naphthalene dianhydride based polyimide copolymers for proton-exchange-membrane fuel cells. I. Monomer and copolymer synthesis
AUTHOR(S): Einsla, Brian R.; Hong, Young-Taik; Kim, Yu Seung; Wang, Feng; Gunduz, Nazan; McGrath, James

E.
CORPORATE SOURCE: Institute for Polymeric Materials and Interfaces, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Journal of Polymer Science, Part A: Polymer Chemistry (2004), 42(4), 862-874
CODEN: JPACEC; ISSN: 0887-624X
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English

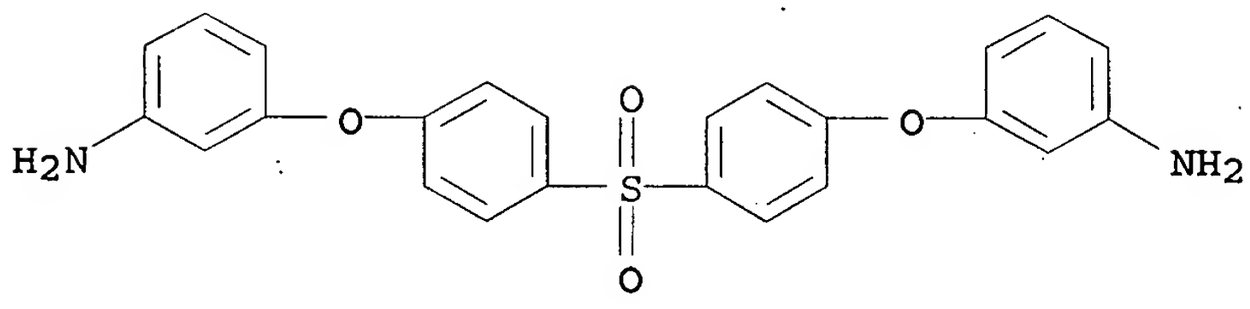
AB A novel sulfonated diamine, 3,3'-disulfonic acid-bis[4-(3-aminophenoxy)-phenyl]sulfone (SA-DADPS), was prepared from m-aminophenol and disodium-3,3'-disulfonate-4,4'-dichlorodiphenylsulfone. The conditions necessary to synthesize and purify SA-DADPS in high yields were investigated in some detail. This disulfonated aromatic diamine, containing ether and sulfone linkages, was used to prepare N-methyl-2-pyrrolidinone-soluble, six-membered ring polyimide copolymers containing pendent sulfonic acid groups by a catalyzed one-step high-temperature polycondensation in m-cresol. These materials showed much improved hydrolytic stability with respect to phthalimides. High-mol.-weight film-forming statistical copolymers with controlled degrees of disulfonation were prepared through variations in the stoichiometric ratio of disulfonated diamine (SA-DADPS) in its soluble triethylamine salt form to several unsulfonated diamines. Three unsulfonated diamines, bis[4-(3-aminophenoxy)-phenyl] sulfone, 4,4'-oxydianiline, and 1,3-phenylenediamine, were used to prepare the copolymers. The characterization of the copolymers by 1H NMR, Fourier transform IR, ion-exchange capacity, and thermogravimetric anal. demonstrated that SA-DADPS was quant. incorporated into the copolymers. Solution-cast films of the sulfonated copolymers were prepared and afforded tough, ductile membranes with high glass-transition temps. Methods were developed to acidify the triethylammonium salt membranes into their disulfonic acid form, this being necessary for proton conduction in a fuel cell. The synthesis and characterization of these materials are described in this article. Future articles will describe the performance of these copolymers as proton-exchange membranes in hydrogen/air and direct methanol fuel cells.

IT **676474-37-6P 676474-38-7P 676474-39-8P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation of monomers and sulfonated naphthalene dianhydride based polyimide copolymers for proton-exchange-membrane fuel cells)

RN 676474-37-6 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-[sulfonylbis(4,1-phenyleneoxy)]bis[benzenamine] (9CI) (CA INDEX NAME)

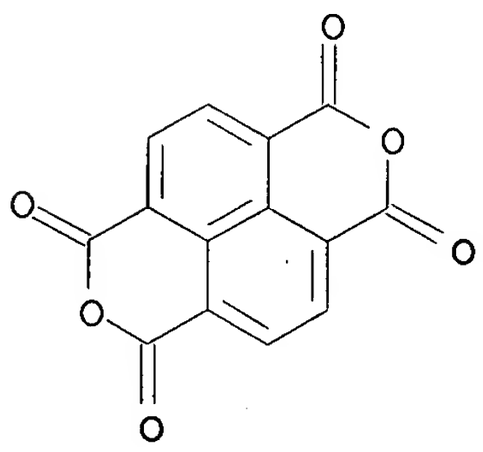
CM 1

CRN 30203-11-3
CMF C24 H20 N2 O4 S



CM 2

CRN 81-30-1
CMF C14 H4 O6

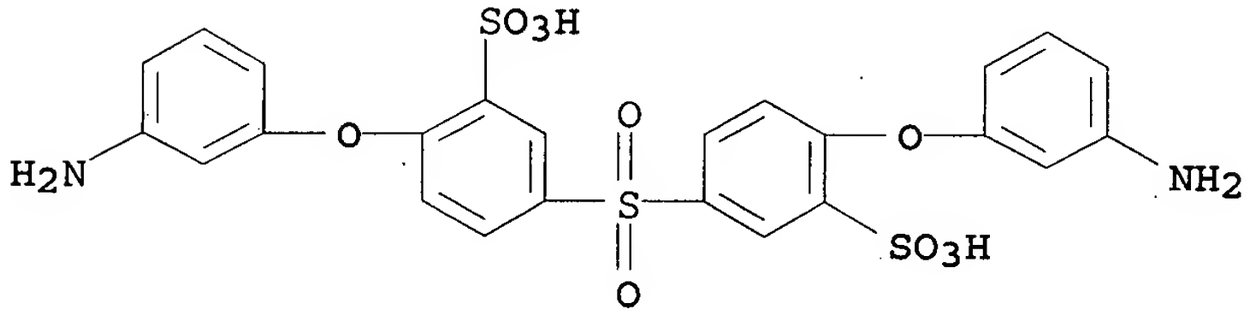


CM 3

CRN 676474-36-5
CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

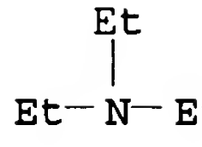
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

CRN 121-44-8
CMF C6 H15 N



RN 676474-38-7 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 4,4'-oxybis[benzenamine] (9CI) (CA INDEX NAME)

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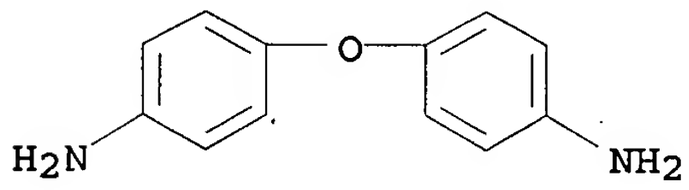
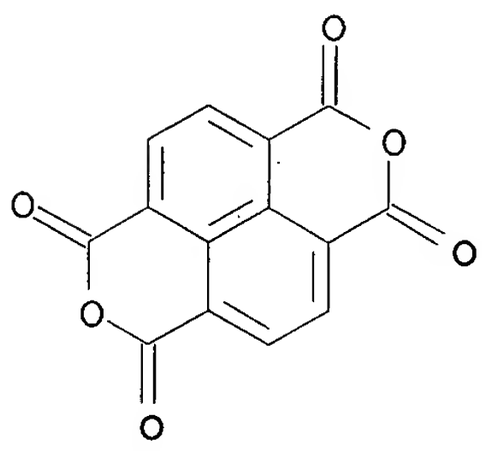


CM 2

CRN 81-30-1
CMF C14 H4 O6

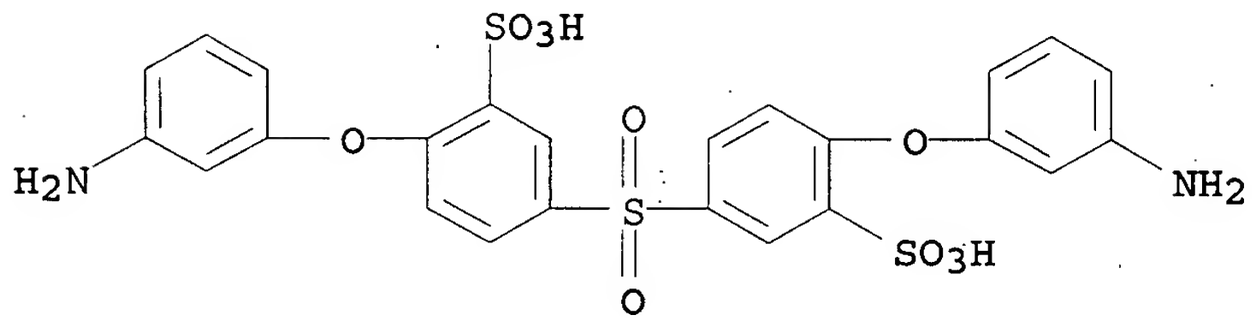


CM 3

CRN 676474-36-5
CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

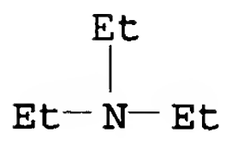
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

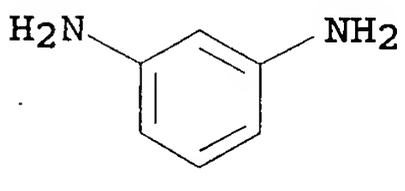
CRN 121-44-8
CMF C6 H15 N



RN 676474-39-8 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with 1,3-benzenediamine and [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone (9CI) (CA INDEX NAME)

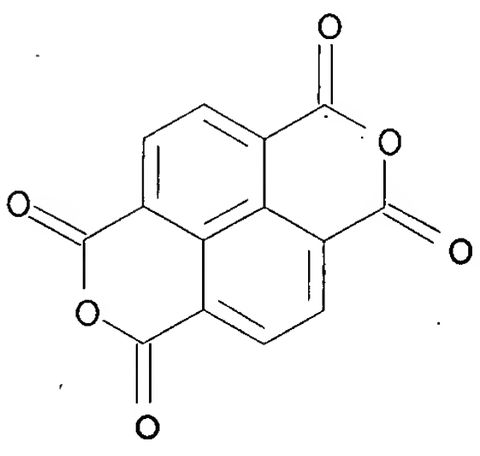
CM 1

CRN 108-45-2
CMF C6 H8 N2



CM 2

CRN 81-30-1
CMF C14 H4 O6

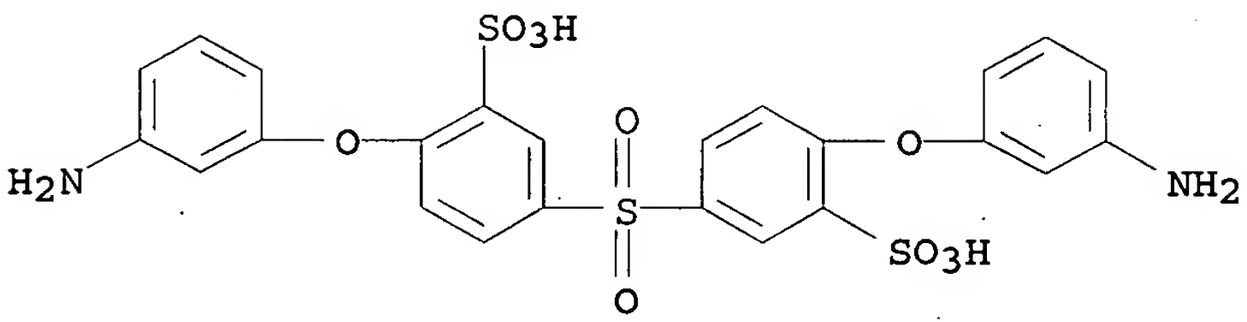


CM 3

CRN 676474-36-5
CMF C24 H20 N2 O10 S3 . 2 C6 H15 N

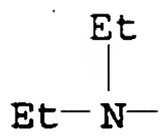
CM 4

CRN 433683-41-1
CMF C24 H20 N2 O10 S3



CM 5

CRN 121-44-8
CMF C6 H15 N



CC 35-5 (Chemistry of Synthetic High Polymers)
Section cross-reference(s): 38
IT 27030-66-6P 27057-55-2P **676474-37-6P**
676474-38-7P 676474-39-8P
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation of monomers and sulfonated naphthalene dianhydride based polyimide copolymers for proton-exchange-membrane fuel cells)
REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

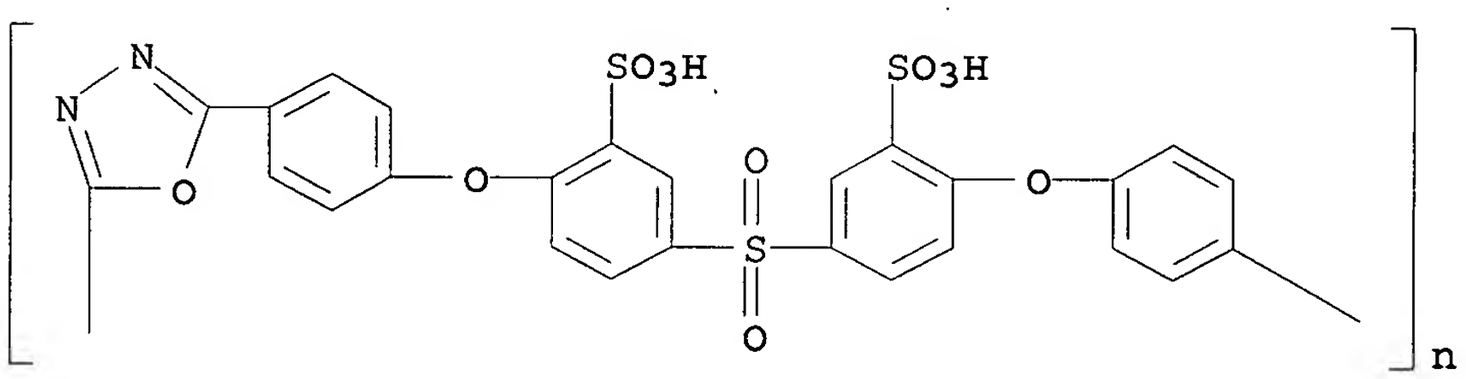
L19 ANSWER 19 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:944625 HCAPLUS
DOCUMENT NUMBER: 140:128766
TITLE: Synthesis and characterization of poly(arylene ether oxadiazole) telechelics
AUTHOR(S): Gomes, Dominique; Nunes, Suzana P.
CORPORATE SOURCE: GKSS Research Center, Geesthacht, D-21502, Germany
SOURCE: Macromolecular Chemistry and Physics (2003), 204(17), 2130-2141
CODEN: MCHPES; ISSN: 1022-1352
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Poly(arylene ether oxadiazole) telechelics with fluorine and hydroxyl end groups were synthesized by nucleophilic substitution

polymerization of 2,5-bis(4-fluorophenyl)-1,3,4-oxadiazole monomer with bishydroxy compds. containing -CMe2, -C(CF3)2 and -SO2- groups. Fluoro telechelics were obtained with about 3 repeating units (mol. weight about 2000 g · mol-1) using an excess (100 mol %) of bis(fluorophenyl) oxadiazole compound On the other hand, hydroxy telechelics were synthesized with about 9 repeating units (mol. weight about 5000 g · mol-1) using a small excess of bishydroxy compound (monomer molar ratio of 0.93). Sulfonated poly(arylene ether oxadiazole) hydroxy telechelics were also synthesized using sulfonated and unsulfonated bishydroxy compds. All sulfonated hydroxy telechelics were partially water soluble, even when only 40 mol % of sulfonated monomers was used. The number of repeating units of hydroxy telechelics increased up to 12 (mol. weight about 9000 g · mol-1) using sulfonated monomers, probably because of the higher reactivity of sulfonated phenoxide. The mol. wts. estimated by 1H NMR were in agreement with the results obtained by SEC. The telechelics can be used as precursors for the synthesis of block copolymers.

IT **648880-55-1P**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(oligomeric; synthesis and characterization of poly(arylene ether oxadiazole) telechelics)

RN 648880-55-1 HCAPLUS

CN Poly[1,3,4-oxadiazole-2,5-diyl-1,4-phenyleneoxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene disodium salt] (9CI) (CA INDEX NAME)



CC 35-5 (Chemistry of Synthetic High Polymers)

IT 31694-04-9P 133030-02-1P 134436-85-4P, 2,5-Bis(4-fluorophenyl)-1,3,4-oxadiazole-bisphenol AF copolymer, SRU 134438-35-0P, 2,5-Bis(4-fluorophenyl)-1,3,4-oxadiazole-bisphenol A copolymer 134438-36-1P, 2,5-Bis(4-fluorophenyl)-1,3,4-oxadiazole-bisphenol AF copolymer 648880-49-3P, 2,5-Bis(4-fluorophenyl)-1,3,4-oxadiazole-bis(4-hydroxyphenyl) sulfone copolymer 648880-52-8P 648880-53-9P 648880-54-0P **648880-55-1P** 648880-56-2P 648880-57-3P
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(oligomeric; synthesis and characterization of poly(arylene ether oxadiazole) telechelics)

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 20 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:319959 HCAPLUS
DOCUMENT NUMBER: 138:339060
TITLE: Crosslinkable aromatic resins having protonic acid groups, and ion conductive polymer membranes, binders, and fuel cells made by using the same
INVENTOR(S): Ishikawa, Junichi; Kuroki, Takashi; Fujiyama, Satoko; Omi, Takehiko; Nakata, Tomoyuki; Okawa, Yuichi; Miyazaki, Kazuhisa; Fujii, Shigeharu; Tamai, Shoji
PATENT ASSIGNEE(S): Mitsui Chemicals, Inc., Japan
SOURCE: PCT Int. Appl., 132 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003033566	A1	20030424	WO 2002-JP10536	20021010
W: CA, CN, IN, JP, KR, US RW: DE, FR, GB, IT, SE				
TW 236486	B	20050721	TW 2002-91123279	20021009
CA 2463429	A1	20030424	CA 2002-2463429	20021010
EP 1457511	A1	20040915	EP 2002-775319	20021010
R: DE, FR, GB, IT, SE, SI, LT, LV, RO, MK, AL				
CN 1630676	A	20050622	CN 2002-820224	20021010
US 2004191602	A1	20040930	US 2004-820842	20040409
PRIORITY APPLN. INFO.:			JP 2001-312799	A 20011010
			JP 2002-182252	A 20020621
			WO 2002-JP10536	W 20021010

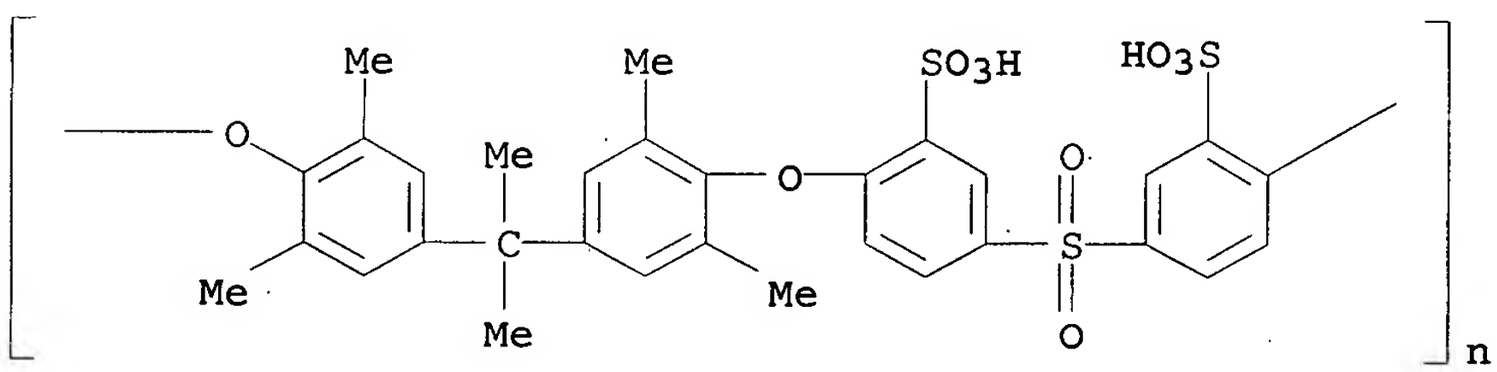
AB The invention relates to (A) a crosslinkable aromatic resin which has crosslinking groups and protonic acid groups and is suitable for electrolyte membranes and binders for fuel cells, (B) polymeric electrolyte membranes and binders for fuel cells, made by using the resin, and (C) fuel cells made by using the membranes or the

binders. The aromatic resin has crosslinking groups which are not derived from protonic acid groups and are capable of causing crosslinking without the formation of a leaving component, and exhibits excellent ionic conductivity, heat resistance, water resistance, and adhesion, and low methanol permeability. It is preferable that the aromatic resin bears as the crosslinking groups both C1-10 alkyl bonded directly to an aromatic ring and carbonyl or carbon-carbon double or triple bonds, while preferred examples of the crosslinkable aromatic resin include aromatic polyether, aromatic polyamide, aromatic polyimide, aromatic polyamide-imide, and aromatic polyazole, each of which has crosslinking groups described above. Thus, 5,5'-carbonylbis(sodium 2-fluorobenzenesulfonate) obtained from 0.525 mol 4,4'-difluorobenzophenone and 210 mL 50% sulfuric acid 4.22, 4,4'-difluorobenzophenone 2.18, and 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane 5.69 g were reacted at 160° for 4 h in the presence of potassium carbonate to give 10.39 g polyether ketone powder with reduced viscosity 0.85 dL/g, glass transition temperature 230°, and 5% weight loss temperature 367°, which was applied on a glass and dried at 200° for 4 h to give a membrane with conductivity 0.018 S/cm at 30° and 0.065 S/cm at 90°.

IT **515811-98-0P**
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation of crosslinkable aromatic resins having protonic acid groups for ion conductive polymer membranes, binders, and fuel cells)

RN 515811-98-0 HCAPLUS

CN Poly[oxy(2,6-dimethyl-1,4-phenylene)(1-methylethylidene)(3,5-dimethyl-1,4-phenylene)oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene) disodium salt] (9CI) (CA INDEX NAME)



●2 Na

IC ICM C08G065-40
ICS C08G069-48; C08G073-10; C08J005-22; H01M008-02

CC 37-3 (Plastics Manufacture and Processing)
Section cross-reference(s): 38, 52

IT 24938-67-8DP, Poly(2,6-dimethyl-1,4-phenylene oxide), sodium sulfonated 267877-35-0DP, reaction products with ethenylphenol 515144-25-9P 515144-26-0P 515144-27-1P 515144-28-2P 515144-29-3P 515144-30-6P 515144-31-7P 515144-32-8P 515144-33-9P 515144-60-2P 515144-61-3P 515144-62-4P 515144-64-6DP, sulfonated 515144-65-7DP, sulfonated **515811-98-0P**
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation of crosslinkable aromatic resins having protonic acid groups

for ion conductive polymer membranes, binders, and fuel cells)
REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

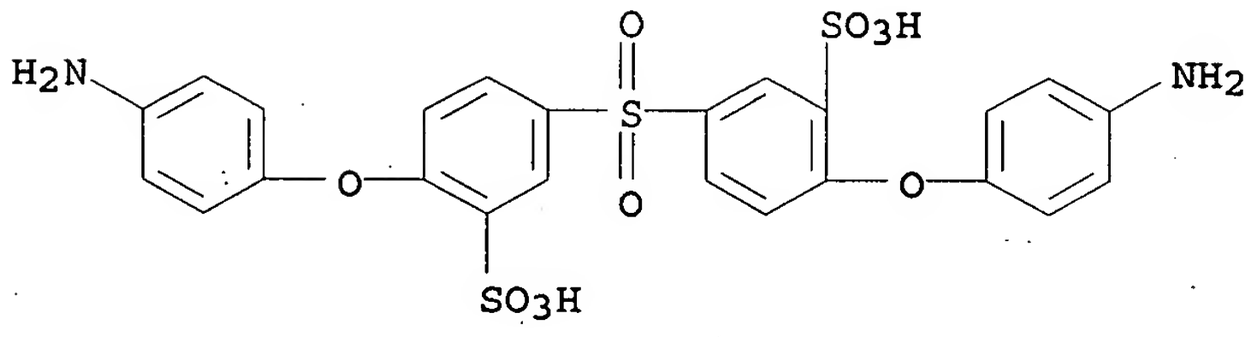
L19 ANSWER 21 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:172081 HCAPLUS
DOCUMENT NUMBER: 138:224172
TITLE: Hydrolysis-resistant polyimide electrolyte membrane for fuel cell
INVENTOR(S): Okamoto, Kenichi; Kita, Hidetoshi; Fang, Jian-Hua; Hirano, Tetsuji
PATENT ASSIGNEE(S): Yamaguchi T.L.O. Y. K., Japan; Ube Industries, Ltd.
SOURCE: Jpn. Kokai Tokkyo Koho, 11 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003068326	A	20030307	JP 2001-254725	200108 24
JP 3910026	B2	20070425		
PRIORITY APPLN. INFO.:			JP 2001-254725	200108 24

AB Title polyimide electrolyte membrane is characterized in that the polyimide is prepared from diamines including sulfonated aromatic diamine H2NA1D1A1NH2 or H2NA2D2A3D2A2NH2 [D1, D2 = O, CH2, C(CH3)2, C(CF3)2, S; A1 = (C1-2 alkyl-substituted) monosulfonated benzene ring; A2 = (C1-2 alkyl-substituted) benzene ring; A3 = sulfonated aromatic group with certain specific structure].
IT **500907-46-0P**
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(hydrolysis-resistant polyimide electrolyte membrane for fuel cell)
RN 500907-46-0 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(4-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-dimethyl[1,1'-biphenyl]-4,4'-diamine (9CI) (CA INDEX NAME)

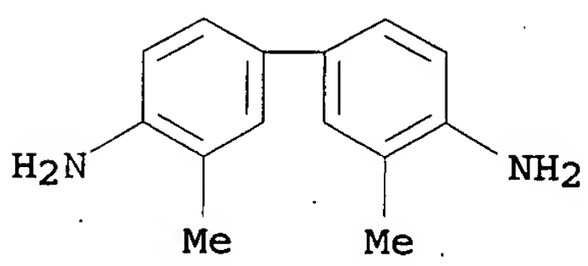
CM 1

CRN 500295-70-5
CMF C24 H20 N2 O10 S3



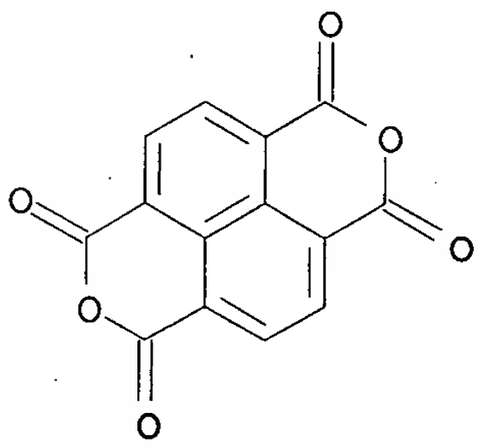
CM 2

CRN 119-93-7
CMF C14 H16 N2



CM 3

CRN 81-30-1
CMF C14 H4 O6



IC ICM H01M008-02
ICS H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT 444075-08-5P 455944-27-1P 500295-68-1P 500295-69-2P
500295-73-8P 500295-74-9P 500295-75-0P 500295-76-1P
500295-77-2P **500907-46-0P**
RL: IMF (Industrial manufacture); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(hydrolysis-resistant polyimide electrolyte membrane for fuel cell)

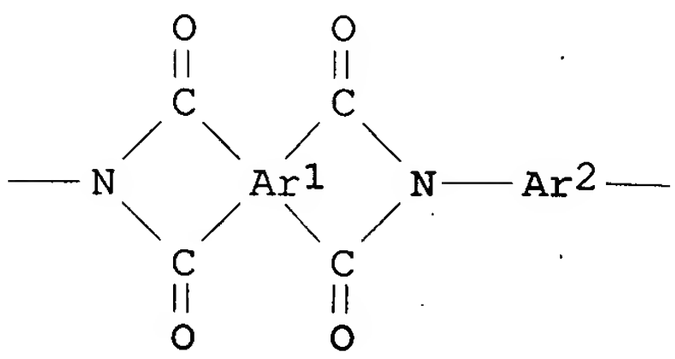
L19 ANSWER 22 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:168552 HCAPLUS
DOCUMENT NUMBER: 138:206141
TITLE: Water-resistant sulfonated aromatic polyimides useful for ion-exchange resins

INVENTOR(S): Okamoto, Kenichi; Kita, Hidetoshi; Fang, Chian-hua; Hirano, Tetsuji
PATENT ASSIGNEE(S): Yamaguchi T.L.O. Y. K., Japan; Ube Industries, Ltd.
SOURCE: Jpn. Kokai Tokkyo Koho, 11 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

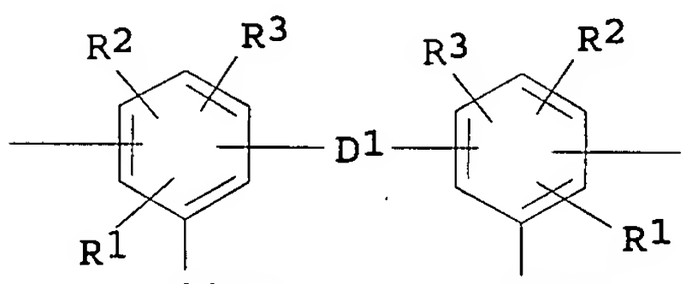
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003064181	A	20030305	JP 2001-254724	200108 24
JP 3717157	B2	20051116		

PRIORITY APPLN. INFO.: JP 2001-254724 200108 24

GI



I



II

AB The sulfonated aromatic polyimides contain structure units represented by the formula I [Ar1 = tetravalent group bearing ≥1 aromatic ring; Ar2 = II; D1 = O, CH2, CMe2, C(CF3)2, S; R1-R3 = H, C1-2 alkyl, D2Ar5D2; D2 = same as D1' Ar5 = linkage, C6H3SO3X(D6C6H3SO3)n which may be substituted with C1-2 alkyl; X = H, alkali metal; n =0-2; Ar5 = (alkali metal salts of) naphthalenedisulfonic acid, fluorenedisulfonic acid , and biphenylfluorenetetrasulfonic acid; D6 = direct bond, O, CH2, CMe2, C(CF3)2, SO2, S, CO]. Thus, 10.0 mol 4,4'-bis(4-aminophenoxy)biphenyl-3,3'-disulfonic acid was reacted with 10.0 mol 1,4,5,8-naphthalenetetracarboxylic acid anhydride at 80° for 4 h, followed with 180° for 20 h, in m-cresol in the presence of Et3N, cooled to room temperature, precipitated in acetone, filtered, and dried to give a product with viscosity (ηsp/C, in

m-cresol) 10. Its solvent-cast film (sulfonic acid Et3N salt-type) was soaked in MeOH then in 1-N HCl for proton exchange, washed with water, and dried to give a film showing no breakage by 180° bending after 250 h in a 80°-water and water absorption 142% after 24 h in a 80°-water.

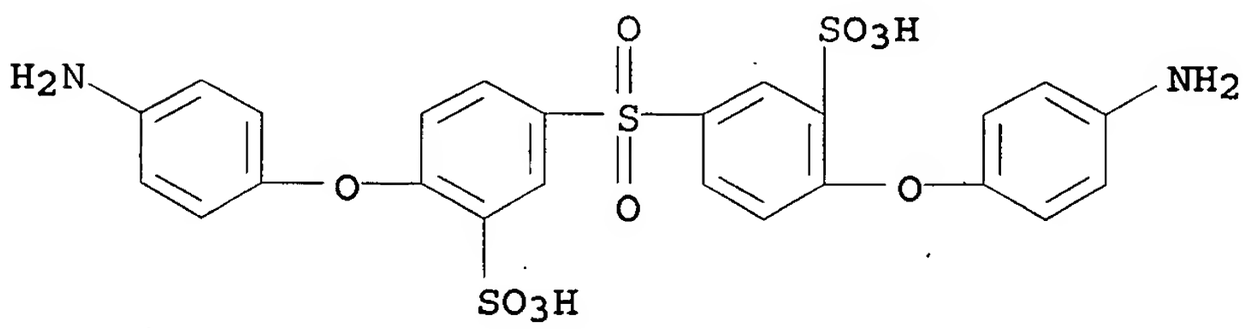
IT **500295-71-6P 500295-72-7P**
RL: IMF (Industrial manufacture); NUU (Other use, unclassified); PREP (Preparation); USES (Uses)
(water-resistant sulfonated aromatic polyimides useful for ion-exchange resins)

RN 500295-71-6 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(4-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone (9CI) (CA INDEX NAME)

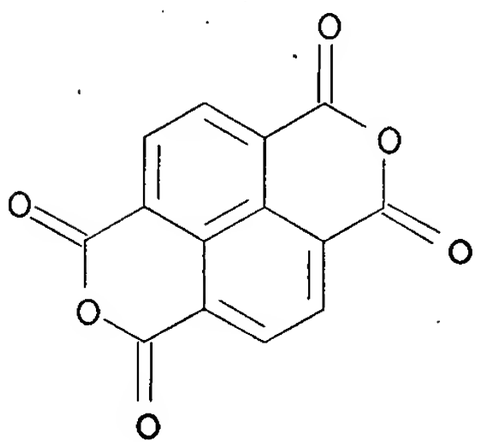
CM 1

CRN 500295-70-5
CMF C24 H20 N2 O10 S3



CM 2

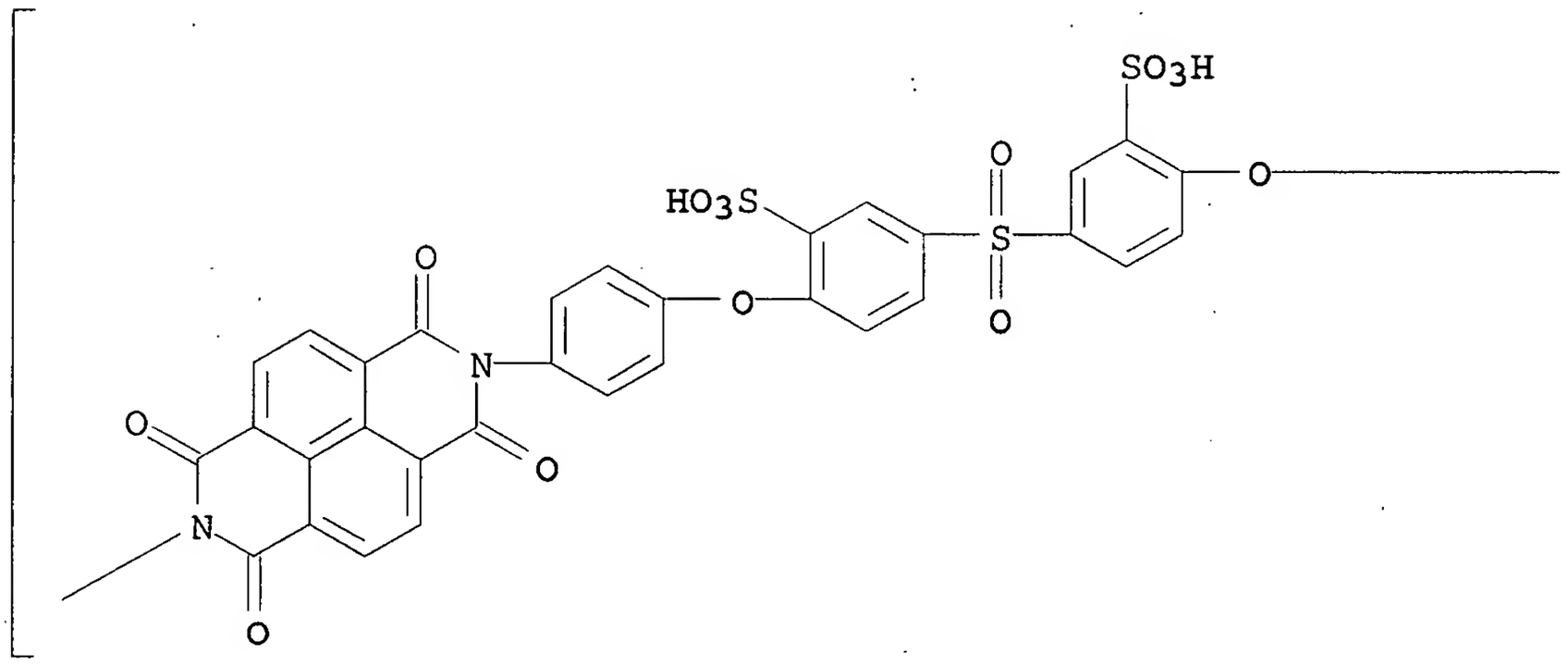
CRN 81-30-1
CMF C14 H4 O6



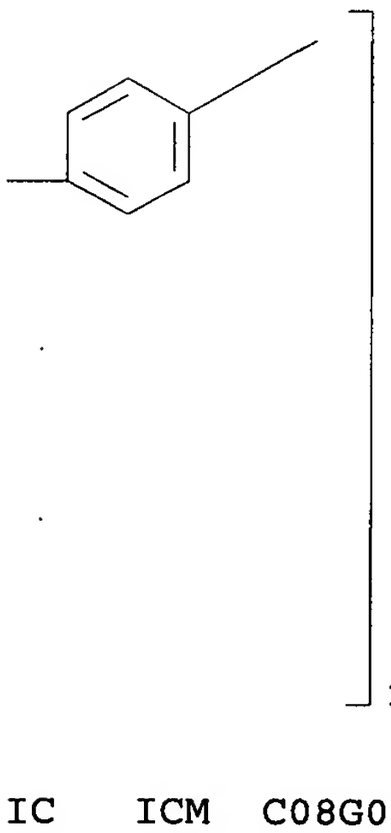
RN 500295-72-7 HCAPLUS

CN Poly[(1,3,6,8-tetrahydro-1,3,6,8-tetraoxobenzo[lmn][3,8]phenanthroline-2,7-diyl)-1,4-phenyleneoxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene] (9CI) (CA INDEX NAME)

PAGE 1-A



PAGE 1-B



IC ICM C08G073-10
ICS B01J039-18
CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 37
IT 444075-08-5P 455944-27-1P 500295-68-1P 500295-69-2P
500295-71-6P 500295-72-7P 500295-73-8P
500295-74-9P 500295-75-0P 500295-76-1P 500295-77-2P
RL: IMF (Industrial manufacture); NUU (Other use, unclassified);
PREP (Preparation); USES (Uses)
(water-resistant sulfonated aromatic polyimides useful for
ion-exchange resins)

L19 ANSWER 23 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2002:232044 HCAPLUS
DOCUMENT NUMBER: 137:6509
TITLE: Synthesis and characterization of sulfonated

MHuang REM4B31 571-272-3952 09/06/2007

polyimides based on six-membered ring as proton exchange membranes

AUTHOR(S): Hong, Young-Taik; Einsla, Brian; Kim, Yuseung; McGrath, James E.

CORPORATE SOURCE: Dep. Chem. Materials Res. Inst., Virginia Polytechnic Inst. State Univ., Blacksburg, VA, 24061, USA

SOURCE: Polymer Preprints (American Chemical Society, Division of Polymer Chemistry) (2002), 43(1), 666-667
CODEN: ACPPAY; ISSN: 0032-3934

PUBLISHER: American Chemical Society, Division of Polymer Chemistry

DOCUMENT TYPE: Journal; (computer optical disk)

LANGUAGE: English

AB Aromatic six-membered ring polyimides containing pendant sulfonic acid groups appear to be promising materials for proton exchange membrane fuel cell applications. 3,3'-Disulfonic acid-bis[4-(3-aminophenoxy)phenyl] sulfone (SA-DADPS) as a sulfonated diamine monomer was prepared by nucleophilic substitution of sodium 3,3'-disulfonate-4,4'-dichlorodiphenyl sulfone (S-DCDPS) with m-aminophenol. A series of copolyimides containing sulfonic acid functional groups were synthesized from six-membered dianhydrides, SA-DADPS and m-BAPS via high-temperature direct polycondensation using m-cresol as a solvent. The copolyimides were characterized for mol. weight, chemical composition, thermal stability, solvent solubility and film forming properties via solution casting from DMAc. The materials are of interest as new polymeric electrolyte proton exchange membranes.

IT **433683-42-2P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(synthesis and characterization of sulfonated polyether-polysulfone-polyimides based on naphthalenetetracarboxylic dianhydride for proton exchange membranes)

RN 433683-42-2 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-(3-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone and 3,3'-[sulfonylbis(4,1-phenyleneoxy)]bis[benzenamine] (9CI) (CA INDEX NAME)

CM 1

CRN 433683-41-1
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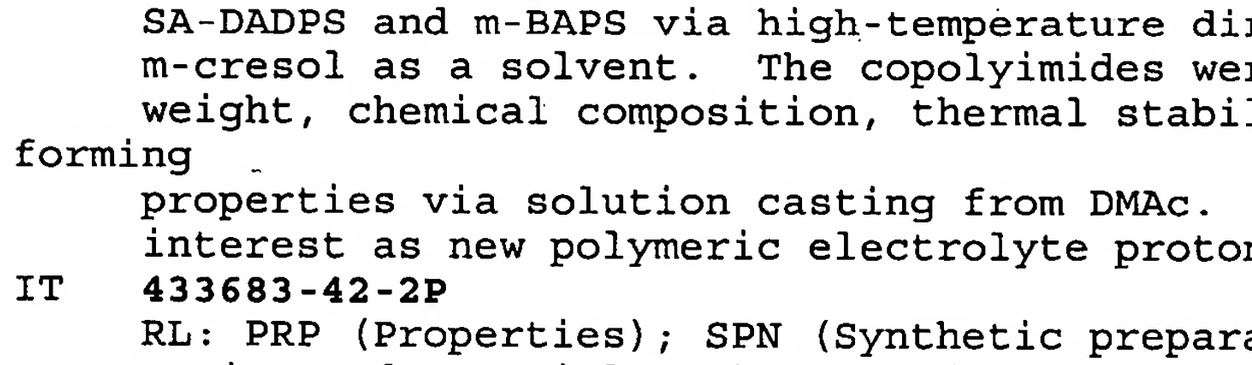
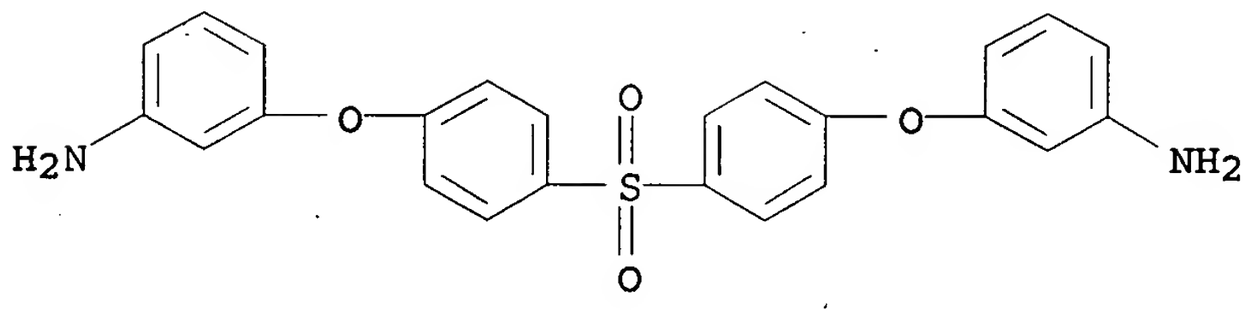


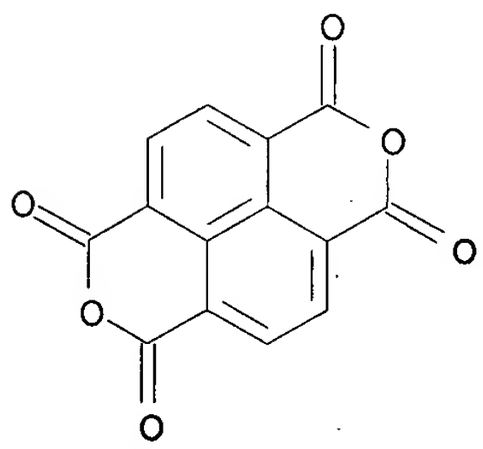
CM 2

CRN 30203-11-3
CMF C24 H20 N2 O4 S



CM 3

CRN 81-30-1
CMF C14 H4 O6



CC 35-5 (Chemistry of Synthetic High Polymers)
IT **433683-42-2P**
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(synthesis and characterization of sulfonated polyether-polysulfone-polyimides based on naphthalenetetracarboxylic dianhydride for proton exchange membranes)
REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

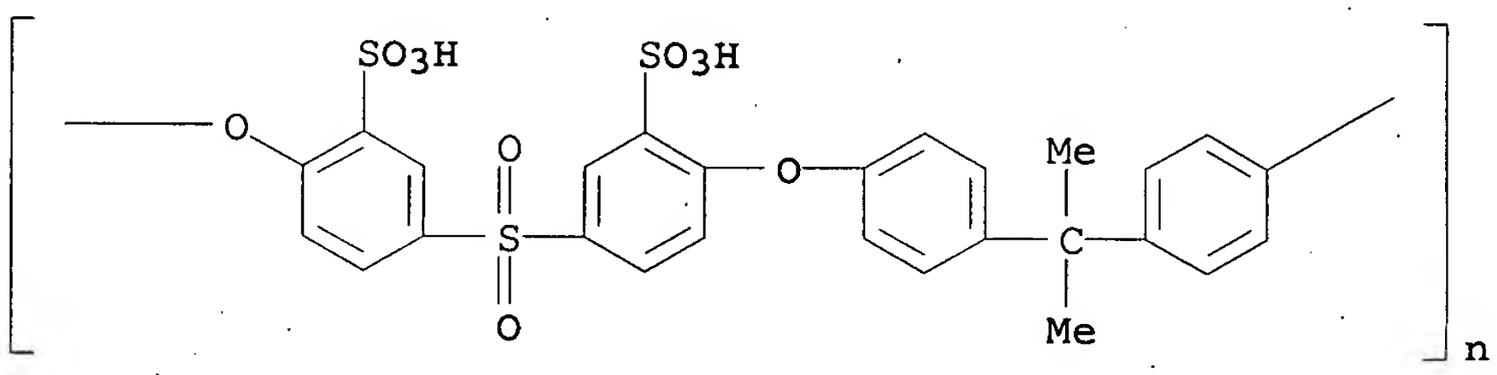
L19 ANSWER 24 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1993:148174 HCAPLUS
DOCUMENT NUMBER: 118:148174
TITLE: Synthesis and characterization of aromatic poly(ether sulfone)s containing pendent sodium sulfonate groups
AUTHOR(S): Ueda, Mitsuru; Toyota, Hidetsugu; Ouchi, Takao; Sugiyama, Junichi; Yonetake, Koichiro; Masuko, Toru; Teramoto, Takero
CORPORATE SOURCE: Fac. Eng., Yamagata Univ., Yonezawa, 992, Japan
SOURCE: Journal of Polymer Science, Part A: Polymer Chemistry (1993), 31(4), 853-8
CODEN: JPACEC; ISSN: 0887-624X
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Poly(ether sulfones) containing pendent sodium sulfonate groups were

prepared by the aromatic nucleophilic substitution reaction of 4,4'-dichlorodiphenylsulfone (I) and sodium 5,5'-sulfonylbis(2-chlorobenzenesulfonate) (II) with bisphenols in the presence of K2CO3 in N,N-dimethylacetamide. A new monomer containing the sodium sulfonate groups was synthesized by the sulfonation of I with fuming H2SO4. The polycondensation proceeded smoothly at 170° and produced the desired poly(ether sulfone)s containing the Na sulfonate with inherent viscosities up to 1.2 dL/g. The polymers were quite soluble in strong acid, dipolar aprotic solvents, m-cresol, and dichloromethane. The thermogravimetry of the polymers showed excellent thermal stability, indicating that 10% weight losses of the polymers were observed in the range above 460° in N atmospheric Both the glass transition temps. and hydrophilicity of the polymers increased with increasing their concns. of Na sulfonate groups.

IT **146673-85-0P**
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and thermal and mech. and wetting properties of)

RN 146673-85-0 HCAPLUS

CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene(1-methylethylidene)-1,4-phenylene sodium salt (1:2)] (CA INDEX NAME)



●2 Na

CC 35-5 (Chemistry of Synthetic High Polymers)
Section cross-reference(s): 36

IT **146673-85-0P** 146673-88-3P 146673-89-4P 146696-52-8P
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation and thermal and mech. and wetting properties of)

L19 ANSWER 25 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1990:21731 HCAPLUS
DOCUMENT NUMBER: 112:21731
TITLE: Polyesters with good crystallinity
INVENTOR(S): Oohashi, Tosha; Matsumoto, Tetsuo; Matsunaga, Nobuhiro; Tsujimoto, Keizo; Imamura, Takayuki
PATENT ASSIGNEE(S): Japan Ester Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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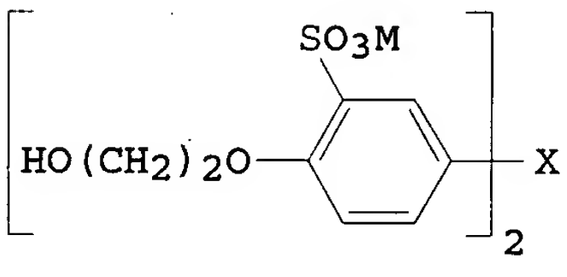
JP 01095152 A 19890413 JP 1987-252117 198710 06

PRIORITY APPLN. INFO.: JP 1987-252117 198710 06

GI



I

AB Polyesters with good crystallinity, useful for injection moldings, are prepared by reaction of diols I [X = CR1R2, O, SO2; M = Na, K; R1, R2 = H, lower alkyl; aromatic ring may contain substituent) with poly(alkylene terephthalates) or their blends with other polyesters with. Thus, 1.5:1 M mixture of terephthalic acid and ethylene glycol (II) was treated at 260° for 5 h in bis(β-hydroxy-ethyl) terephthalate and its oligomer, then the product was treated with 0.2 mol% I (X = CMe2, M = Na) (III) in II in the presence of Sb2O3 at 280° and 1 Torr to give a polymer showing m.p. 252.0° and crystallization temperature 126.5° on heating and 210.5° on cooling, vs. 258.0, 137.5, and 185.0, resp., without III.

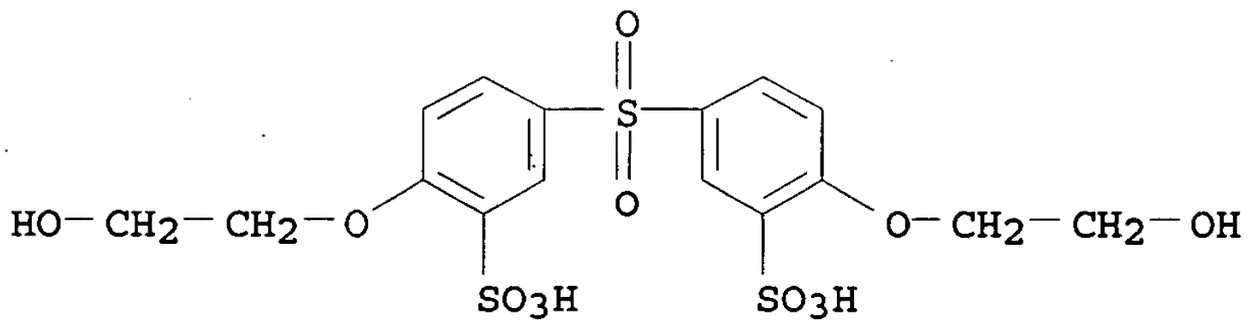
IT **124406-98-0P**, Bis(4-β-hydroxyethoxy-3-sodiosulfophenyl) sulfone-bis(β-hydroxyethyl) terephthalate-ethylene glycol-terephthalic acid copolymer
RL: PREP (Preparation)
(preparation of, with good crystallinity)

RN 124406-98-0 HCAPLUS

CN 1,4-Benzenedicarboxylic acid, polymer with bis(2-hydroxyethyl) 1,4-benzenedicarboxylate, 1,2-ethanediol and 3,3'-sulfonylbis[6-(2-hydroxyethoxy)benzenesulfonic acid] disodium salt (9CI) (CA INDEX NAME)

CM 1

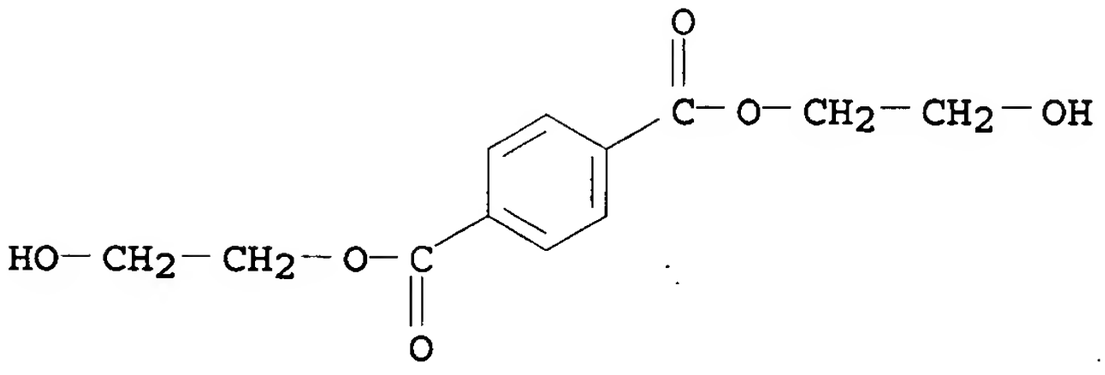
CRN 124406-97-9
CMF C16 H18 O12 S3 . 2 Na



●2 Na

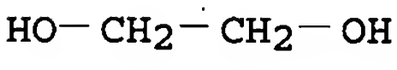
CM 2

CRN 959-26-2
CMF C12 H14 O6



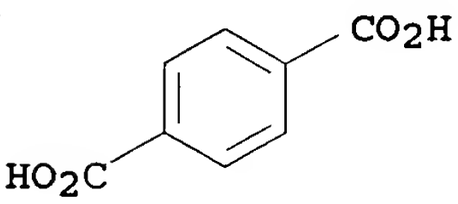
CM 3

CRN 107-21-1
CMF C2 H6 O2



CM 4

CRN 100-21-0
CMF C8 H6 O4



IC ICM C08L067-00
ICS C08K005-42
CC 37-3 (Plastics Manufacture and Processing)
Section cross-reference(s): 35

IT 124396-82-3P 124396-84-5P, Bis(4-β-hydroxyethoxy-3-sodiosulfophenyl) ether-bis(β-hydroxyethyl) terephthalate-ethylene glycol-terephthalic acid copolymer
124396-85-6P **124406-98-0P**, Bis(4-β-hydroxyethoxy-3-sodiosulfophenyl) sulfone-bis(β-hydroxyethyl) terephthalate-ethylene glycol-terephthalic acid copolymer
RL: PREP (Preparation)
(preparation of, with good crystallinity)

L19 ANSWER 26 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1984:7729 HCAPLUS
DOCUMENT NUMBER: 100:7729
TITLE: Hydrophilic resin compositions
PATENT ASSIGNEE(S): Unitika Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

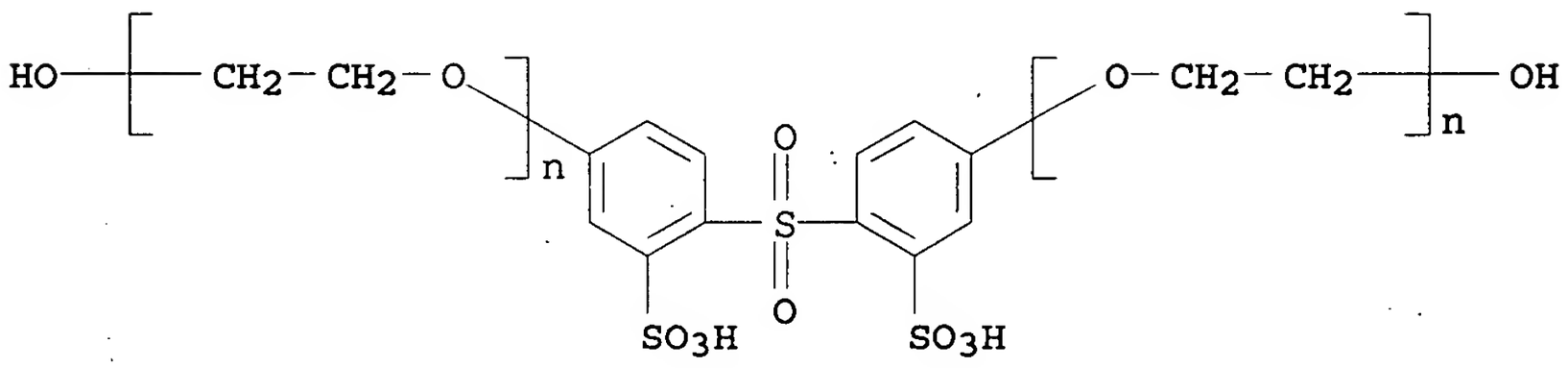
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 58084849	A	19830521	JP 1981-182726	19811113
PRIORITY APPLN. INFO.:			JP 1981-182726	19811113

AB The title compns. contain polyesters, polyamides, or polyester-polyamides prepared with sulfonated, alkoxylated bisphenols and other thermoplastics. The compns. have good water absorption and are useful in textile products. Thus, bis(2-hydroxyethyl) terephthalate was copolymd. with ethoxylated (d.p. 80) 2,2'-disulfobisphenol A to give a block copolymer, 10 parts of which was mixed with 90 parts poly(ethylene terephthalate) and spun to fibers. Fabrics prepared from these fibers had good antistatic properties.

IT **87092-91-9D**, polymers with bis(2-hydroxyethyl)terephthalate
RL: USES (Uses)
(fibers, antistatic, hydrophilic)

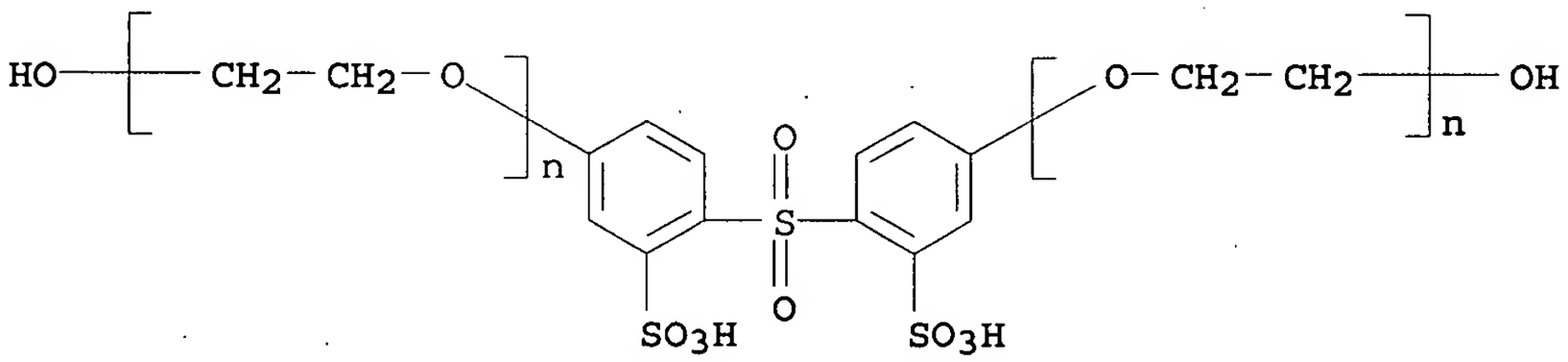
RN 87092-91-9 HCAPLUS

CN Poly(oxy-1,2-ethanediyl), α,α'-[sulfonylbis(3-sulfo-4,1-phenylene)]bis[ω-hydroxy-, disodium salt (9CI) (CA INDEX NAME)



●2 Na

IT **87092-91-9P**
RL: PREP (Preparation)
(preparation of)
RN 87092-91-9 HCAPLUS
CN Poly(oxy-1,2-ethanediyl), α,α'-[sulfonylbis(3-sulfo-4,1-phenylene)]bis[ω-hydroxy-, disodium salt (9CI) (CA INDEX NAME)



●2 Na

IC C08L067-00
ICI C08L067-00, C08L077-00
CC 37-3 (Plastics Manufacture and Processing)
Section cross-reference(s): 40
IT 84749-56-4 **87092-91-9D**, polymers with bis(2-hydroxyethyl)terephthalate 87092-93-1
RL: USES (Uses)
(fibers, antistatic, hydrophilic)
IT 84749-55-3P **87092-91-9P** 87092-92-0P
RL: PREP (Preparation)
(preparation of)

L19 ANSWER 27 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1980:42604 HCAPLUS
DOCUMENT NUMBER: 92:42604
TITLE: Polysulfones
INVENTOR(S): Gaca, Jerzy; Kozlowski, Kazimierz; Echaust, Lucyna; Kucybala, Zdzislaw
PATENT ASSIGNEE(S): Akademia Techniczno-Rolnicza, Bydgoszcz, Pol.
SOURCE: Pol., 2 pp.

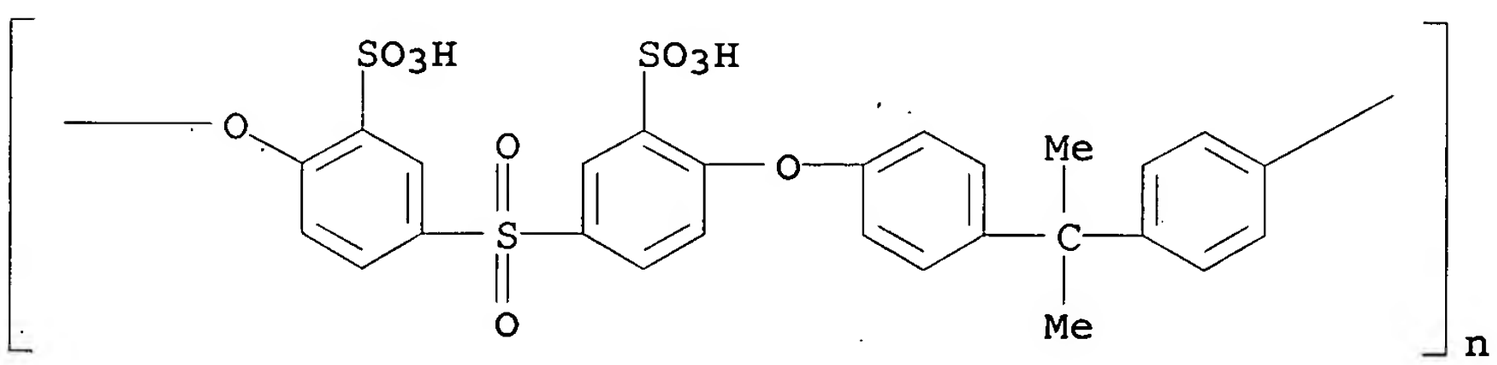
CODEN: POXXA7
DOCUMENT TYPE: Patent
LANGUAGE: Polish
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PL 102339	B1	19790331	PL 1977-197561	197704 21
PRIORITY APPLN. INFO.:			PL 1977-197561 A	197704 21

AB Water-soluble polysulfones are prepared by condensation of Na or K salts of 4,4'-sulfonylbis[1-chloro-2-benzenesulfonic acid] (I) with Na or K bisphenolates at 1:1 ratio in aprotic dipolar solvents at 100-200°. Thus, a polysulfone (II) [72355-90-9] was prepared by condensation of Na salt of bisphenol A with Na salt of I at .apprx.160° in the presence of NaNH2 catalyst in DMSO-C6H5Cl mixture from which water was removed by azeotropic distillation and treatment with CaO. II had mol. weight 17,000-20,000 and it lost 16% of the weight on heating at 700°.

IT **146673-85-0**
RL: USES (Uses)
(heat-resistant)

RN 146673-85-0 HCAPLUS
CN Poly[oxy(2-sulfo-1,4-phenylene)sulfonyl(3-sulfo-1,4-phenylene)oxy-1,4-phenylene(1-methylethylidene)-1,4-phenylene sodium salt (1:2)] (CA INDEX NAME)



●2 Na

IC C08G075-20
CC 35-3 (Synthetic High Polymers)
IT 72355-90-9 **146673-85-0**
RL: USES (Uses)
(heat-resistant)

L19 ANSWER 28 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1974:438868 HCAPLUS
DOCUMENT NUMBER: 81:38868
TITLE: Ethoxylated benzenesulfonate antistatic agents for acrylonitrile polymers
INVENTOR(S): Radlmann, Eduard; Nischk, Guenther E.

PATENT ASSIGNEE(S): Bayer A.-G.
SOURCE: Ger. Offen., 23 pp.
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

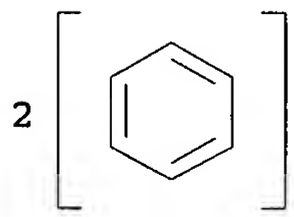
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 2217961	A1	19731025	DE 1972-2217961	197204 14
PRIORITY APPLN. INFO.:			DE 1972-2217961 A	197204 14

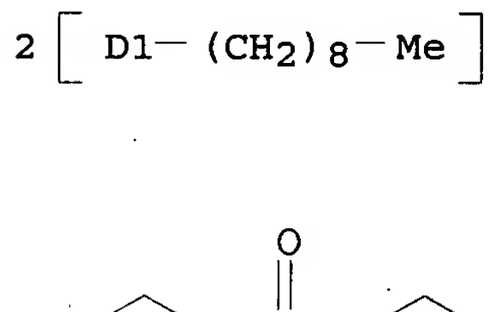
AB Salts of polyalkylene glycol sulfophenyl ethers are effective antistatic agents for acrylic fibers. Thus, distillation of MeOH from a mixture of 121.4 parts polyethylene glycol monostearyl ether [9005-00-9] (mol. weight 1214) and 5.4 parts NaOMe in 150 parts MeOH, addition of 26.0 parts sodium 4-chloro-3-nitrobenzene sulfonate [17691-19-9], and stirring at 65.deg. to pH 7 gives 100% polyethylene glycol 2-nitro-4-sulfophenyl stearyl ether sodium salt (I) [51433-79-5]. Fibers of 94:5:1 acrylonitrile-methyl acrylate-sodium methallylsulfonate copolymer [26658-88-8] containing 7% I have surface resistance 8 .tim. 1010, 9 .tim. 1010, and 1 .tim. 1011 Ω after 0, 5, and 10 washings, resp., compared with >1013 in the absence of I.

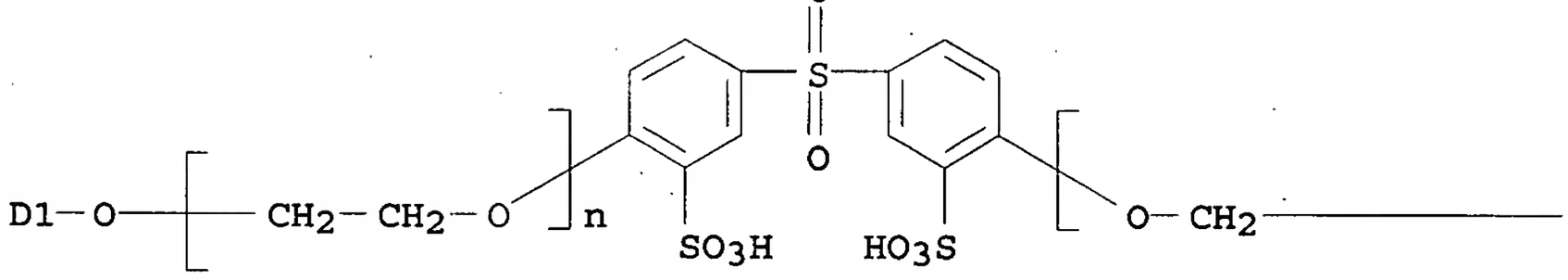
IT **51852-83-6**
RL: USES (Uses)
(antistatic agents, for acrylic fibers)

RN 51852-83-6 HCAPLUS
CN Poly(oxy-1,2-ethanediyl), α,α'-[sulfonylbis(2-sulfo-4,1-phenylene)]bis[ω-(nonylphenoxy)-, disodium salt (9CI) (CA INDEX NAME)

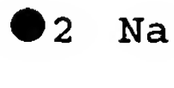
PAGE 1-A

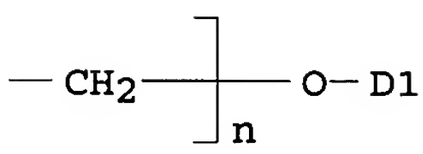






PAGE 1-B





IC C08G; C08F
CC 39-10 (Textiles)
IT 51433-79-5 51569-22-3 51852-82-5 **51852-83-6**
51909-21-8
RL: USES (Uses)
(antistatic agents, for acrylic fibers)

L19 ANSWER 29 OF 29 HCAPLUS COPYRIGHT 2007 ACS on STN

MHuang REM4B31 571-272-3952 09/06/2007

ACCESSION NUMBER: 1974:122248 HCAPLUS
DOCUMENT NUMBER: 80:122248
TITLE: Acrylonitrile polymers with antistatic ethoxylated benzenesulfonates
INVENTOR(S): Radlmann, Eduard; Nischk, Guenther
PATENT ASSIGNEE(S): Farbenfabriken Bayer A.-G.
SOURCE: Ger. Offen., 20 pp.
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 2217974	A1	19731025	DE 1972-2217974	197204 14
IT 981943	B	19741010	IT 1973-22938	197304 12
GB 1416574	A	19751203	GB 1973-17601	197304 12
CA 1002062	A1	19761221	CA 1973-168547	197304 12
BE 798179	A1	19731015	BE 1973-129978	197304 13
NL 7305221	A	19731016	NL 1973-5221	197304 13
FR 2180103	A1	19731123	FR 1973-13546	197304 13
JP 49018937	A	19740219	JP 1973-41467	197304 13
US 3875127	A	19750401	US 1973-350959	197304 13
ES 413653	A1	19760116	ES 1973-413653	197304 13
PRIORITY APPLN. INFO.:			DE 1972-2217974 A	197204 14

AB Ethoxylated benzenesulfonates (I, R = Me(CH2)17, H19C9C6H4; R1 = NH2, NO2, SO2; Z = O, NMe; n = 1,2; x = 12-21) and II were prepared and when added to an acrylic polymer spinning solution in DMF gave fibers with washfast, antistatic finishes. Thus, 121.4 parts of a H2O free ethoxylated stearyl alc. (mean mol. weight 1214) was treated with 5.4 parts of NaOMe in 150 ml, the MeOH removed at 70.deg., cooled to room temperature, and 4,3-Cl(O2N)C6H3SO3Na was added to the melt in portions keeping the reaction at 65.deg. to give a quant. yield of waxy Na 3-nitro-4-[(stearyloxy)poly(ethyleneoxy)]benzensulfonate (III) [51382-33-3]. A 27% solution of III was added to an acrylic

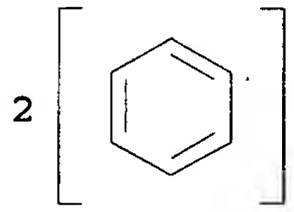
polymer spinning solution, followed by dry spinning , and stretching to give a fiber containing 7% III. The surface resistance of the untreated fiber was >1013 Ω while for unwashed, 5 times washed, and 10 washed fiber it was 8 .tim. 1010, 9 .tim. 1010, and 1 .tim. 1011, resp.

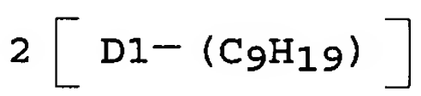
IT **52624-78-9**
RL: USES (Uses)
(antistatic agent, for acrylic fibers)

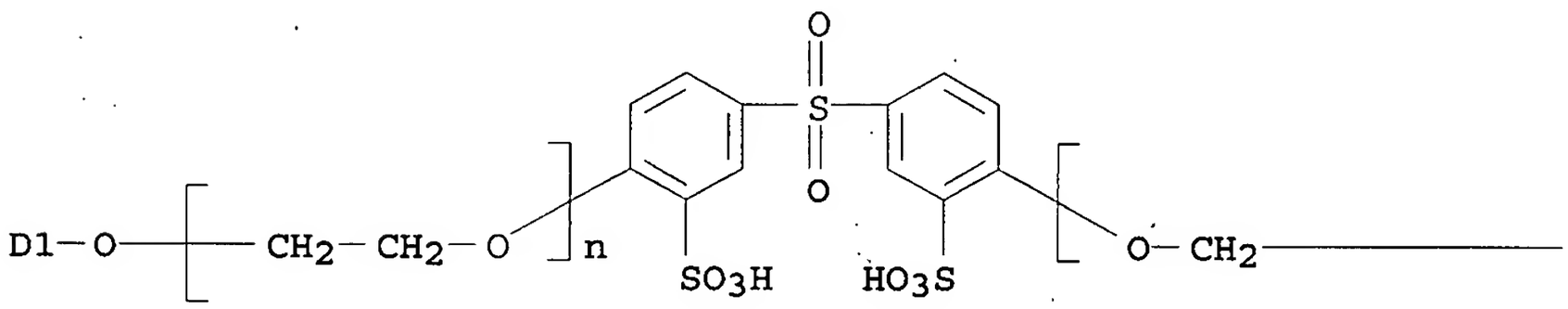
RN 52624-78-9 HCAPLUS

CN Poly(oxy-1,2-ethanediyl), α,α'-[sulfonylbis(2-sulfo-4,1-phenylene)]bis[ω-(isononylphenoxy)-, disodium salt (9CI) (CA INDEX NAME)

PAGE 1-A

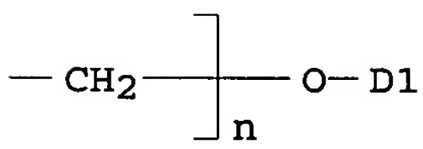






PAGE 1-B

●2 Na



IC D01F; C08F
CC 39-2 (Textiles)
IT 51569-22-3 51909-21-8 **52624-78-9** 52642-15-6
RL: USES (Uses)
(antistatic agent, for acrylic fibers)

=> d l24 ibib abs hitstr hitind 1-11

L24 ANSWER 1 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:471208 HCAPLUS
DOCUMENT NUMBER: 143:8875
TITLE: Acidic group-containing polybenzimidazole compositions and their application
INVENTOR(S): Sakaguchi, Yoshimitsu; Kitamura, Kota
PATENT ASSIGNEE(S): Toyobo Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 27 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005139318	A	20050602	JP 2003-377857	200311 07

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PRIORITY APPLN. INFO.: JP 2003-377857 200311 07

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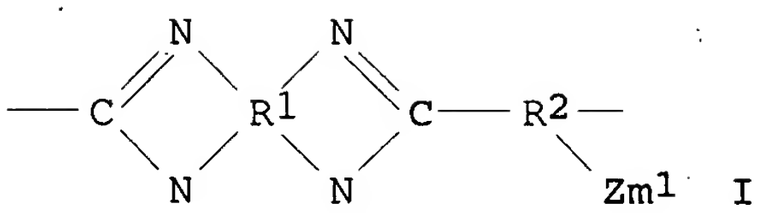
GI

MHuang REM4B31 571-272-3952 09/06/2007



I

AB The compns. contain polybenzimidazoles having structural units I (m1 = 1-4; R1 = imidazole ring-forming tetravalent aromatic bonding unit; R2 = divalent aromatic bonding unit; Z = sulfonic acid residue, phosphonic acid residue) and poly(arylene ethers) having structural units of C6H3(SO3X)-p-YC6H3(SO3X)-p-OArO (both SO3X are in m-position to Y; Ar = divalent aromatic; Y = SO2, CO; X = H, monovalent cation) and C6H3(o-CN)OAr'O (Ar' = divalent aromatic). Ion-conductive **membranes** containing the compns., their composites with electrodes, fuel cells using the composites and preferably a MeOH fuel, water electrolysis apparatus using the composites, adhesives containing the compns., and manufacture of the ion-conductive **membranes** by casting step and drying step are also claimed. Thus, a solution containing 2,5-dicarboxybenzenesulfonic acid monosodium salt-3,3',4,4'-tetraaminodiphenylsulfone copolymer and 4,4'-biphenol-2,6-dichlorobenzonitrile-3,3'-disulfo-4,4'-dichlorodiphenylsulfone disodium salt copolymer was cast to give a film, which was processed to give a **membrane** showing ion conductivity 0.034 S/cm and MeOH permeability 2.97 mmol/m2-s.

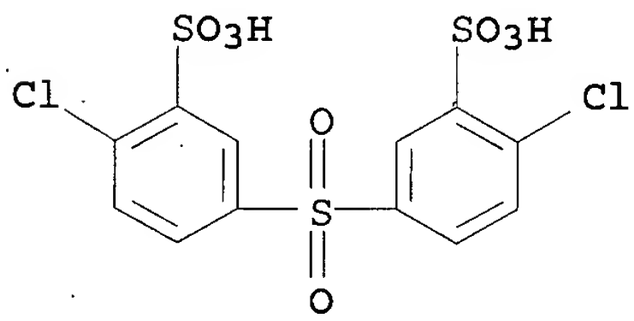
IT **681035-31-4P**
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

RN 681035-31-4 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (CA INDEX NAME)

CM 1

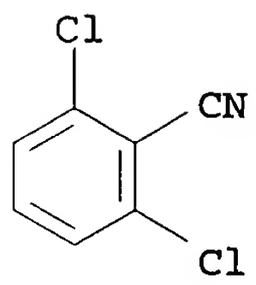
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

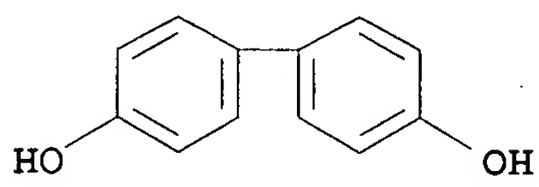
CM 2

CRN 1194-65-6
CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6
CMF C12 H10 O2



IC ICM C08G073-18
ICS C08G065-34; C08J005-22; C09J171-10; C09J179-04; C25B013-08; H01B001-06; H01B013-00; H01M008-02; H01M008-10; C08L079-06

CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 52, 72

ST fuel cell ion conductive **membrane** polybenzimidazole polyoxyarylene; methanol fuel cell ion conductive **membrane** ; water electrolysis app ion conductive **membrane** electrode composite; adhesive acid group polybenzimidazole polyarylene ether; dicarboxybenzenesulfonic acid tetraaminodiphenylsulfone copolymer ion conductive **membrane**; biphenol dichlorobenzonitrile disulfodichlorodiphenylsulfone copolymer ion conductive **membrane**

IT Adhesives
Electrolytic cells
Fuel cell electrolytes
Ion exchange membranes
Ionic conductors
(polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polybenzimidazole-; polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES

(Uses)
(polyoxyarylene-; polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

IT Polybenzimidazoles
Polyoxyarylenes
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polysulfone-; polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

IT 67-56-1, Methanol, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(fuel in fuel cell; polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

IT 425636-38-0P, 2,5-Dicarboxybenzenesulfonic acid monosodium salt-3,3',4,4'-tetraaminodiphenylsulfone copolymer 426255-33-6P **681035-31-4P** 852415-23-7P
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polybenzimidazole- and poly(arylene ether)-containing compns. for ion-conductive **membranes** in fuel cells and water electrolysis apparatus and adhesives)

L24 ANSWER 2 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:449863 HCAPLUS
DOCUMENT NUMBER: 142:489515
TITLE: Solid polymer type electrolytic **membrane** superior in gas barrier property, workability, dimensional stability, ion conductivity and liquid permeation inhibition for water electrolysis
INVENTOR(S): Yamashita, Masahiro; Takase, Satoshi; Sakaguchi, Yoshimitsu; Kitamura, Kota
PATENT ASSIGNEE(S): Toyobo Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 19 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005133146	A	20050526	JP 2003-370160	200310 30 <--

PRIORITY APPLN. INFO.: JP 2003-370160 200310 30 <--

AB The solid polymer type **ion exchange membrane** for water anal. contains polyarylene ether compound and has O2 permeability of 0.1x10-12-3x10-12 mol/cm.s.

IT **681035-31-4P**

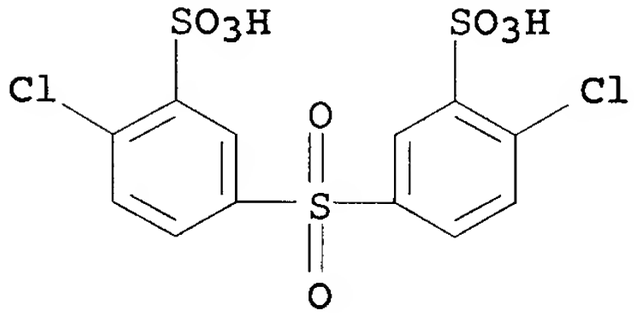
MHuang REM4B31 571-272-3952 09/06/2007

RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(solid polymer type electrolytic **membrane** superior in gas barrier property, workability, dimensional stability, ion conductivity and liquid permeation inhibition for water electrolysis)

RN 681035-31-4 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (CA INDEX NAME)

CM 1

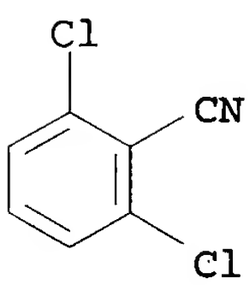
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



● 2 Na

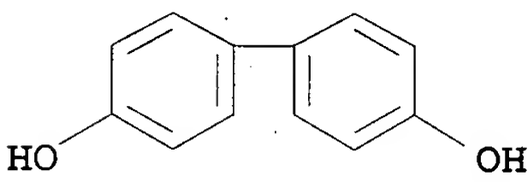
CM 2

CRN 1194-65-6
CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6
CMF C12 H10 O2



IC ICM C25B013-08
ICS C08G065-40; C25B009-10; H01B001-06
CC 72-9 (Electrochemistry)

MHuang REM4B31 571-272-3952 09/06/2007

Section cross-reference(s): 38
ST polyarylene ether compd **membrane** water electrolysis
IT Water purification
(electrolysis; solid polymer type electrolytic **membrane** superior in gas barrier property, workability, dimensional stability, ion conductivity and liquid permeation inhibition for water electrolysis)
IT **Ion exchange membranes**
(solid polymer type electrolytic **membrane** superior in gas barrier property, workability, dimensional stability, ion conductivity and liquid permeation inhibition for water electrolysis)
IT Polyethers, uses
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(solid polymer type electrolytic **membrane** superior in gas barrier property, workability, dimensional stability, ion conductivity and liquid permeation inhibition for water electrolysis)
IT **681035-31-4P** 681035-36-9P 681035-37-0P
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(solid polymer type electrolytic **membrane** superior in gas barrier property, workability, dimensional stability, ion conductivity and liquid permeation inhibition for water electrolysis)

L24 ANSWER 3 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:235276 HCAPLUS
DOCUMENT NUMBER: 142:282889
TITLE: **Ion exchange** **membrane** composite for fuel cell
INVENTOR(S): Yamashita, Masahiro; Takase, Satoshi; Takimoto, Naohiko; Nakamura, Muneatsu; Sasai, Kosuke
PATENT ASSIGNEE(S): Toyobo Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 42 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005068396	A	20050317	JP 2003-410546	20031209

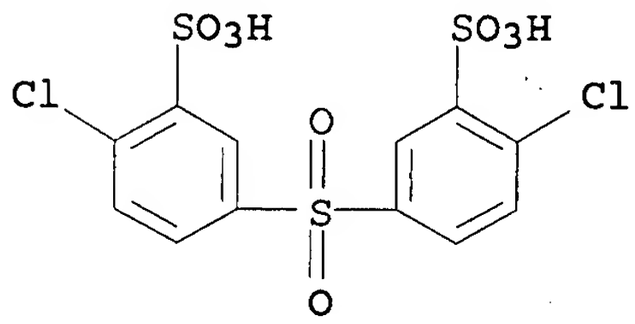
PRIORITY APPLN. INFO.: JP 2003-114628 A 20030418 <--
JP 2003-288193 A 20030806 <--

AB The composite has a support **membrane** having continuous open pores for both sides and an **ion exchange** resin infiltrated in the support to satisfy **ion exchange** resin filling ratio in the pores ≥90%. The composite for an electrolyte **membrane** of a fuel cell has high ion conductivity and prevents liquid fuel permeation.

IT **681035-31-4P**
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**ion exchanger; ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
RN 681035-31-4 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (CA INDEX NAME)

CM 1

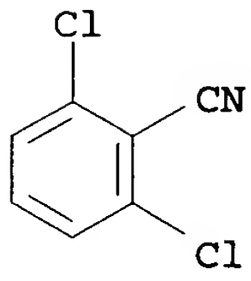
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

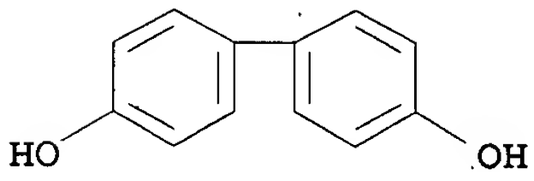
CM 2

CRN 1194-65-6
CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6
CMF C12 H10 O2



IC ICM C08J005-22

MHuang REM4B31 571-272-3952 09/06/2007

ICS B01J039-18; B01J047-12; C08G065-40; H01B001-06; H01M008-02; H01M008-10; C08L079-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST **ion exchange** resin porous **membrane** composite fuel cell; fuel cell electrolyte **membrane** **ion exchanger** composite
IT **Membranes**, nonbiological
(composite; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Polyoxyalkylenes, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(fluorine- and sulfo-containing, ionomers, Nafion, **ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Fuel cell electrolytes
Ion exchangers
(**ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polyarylene-polyether-, sulfo-containing, **ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polyarylene-polysulfone-, sulfo-containing, **ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Fluoropolymers, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers, Nafion, **ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Ionomers
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, Nafion, **ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(sulfonated, **ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT Polybenzoxazoles
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(support; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)
IT 90960-37-5

RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(assumed monomers, support; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)

IT **681035-31-4P**
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)

IT 582300-03-6, Nafion SE 20192 582300-05-8, Nafion SE 10192
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**ion exchanger**; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)

IT 60871-72-9 167304-74-7 169836-78-6
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(support; **ion exchange** resin-porous **membrane** support composite for fuel cell electrolyte)

L24 ANSWER 4 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:355275 HCAPLUS
DOCUMENT NUMBER: 140:376230
TITLE: Composite **ion exchanger** **membrane**
INVENTOR(S): Kitamura, Kota; Sakaguchi, Yoshimitsu; Nagahara, Shigenori; Hamamoto, Shiro; Takimoto, Naohiko; Sugihara, Hideki; Takase, Satoshi; Kitagawa, Tooru; Saito, Miyako
PATENT ASSIGNEE(S): Toyo Boseki Kabushiki Kaisha, Japan
SOURCE: PCT Int. Appl., 92 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2004036679	A1	20040429	WO 2003-JP13278	200310 16

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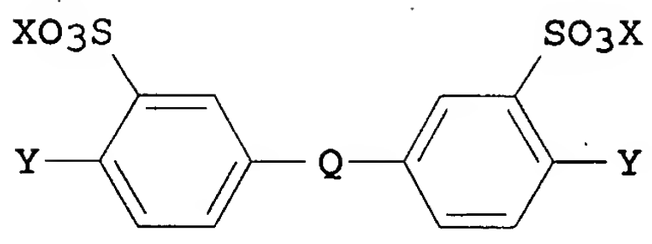
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

JP 2004139836	A	20040513	JP 2002-303289	200210 17
JP 2004139837	A	20040513	JP 2002-303290	200210 17
JP 2004143388	A	20040520	JP 2002-312837	200210 28
JP 2004169003	A	20040617	JP 2003-355364	200310 15
AU 2003273034	A1	20040504	AU 2003-273034	200310 16
US 2006241192	A1	20061026	US 2005-530965	200504 11

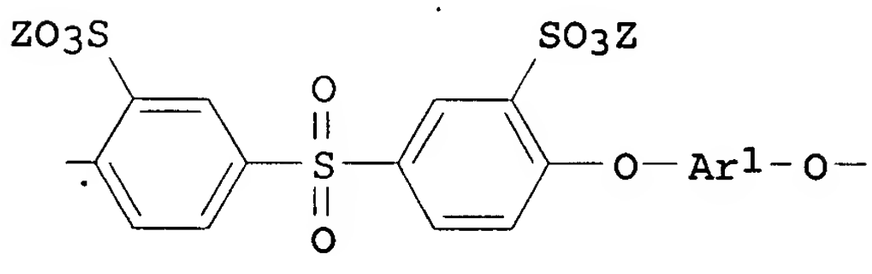
PRIORITY APPLN. INFO.:

JP 2002-303289	A	200210 17
JP 2002-303290	A	200210 17
JP 2002-312837	A	200210 28
JP 2002-313025	A	200210 28
WO 2003-JP13278	W	200310 16

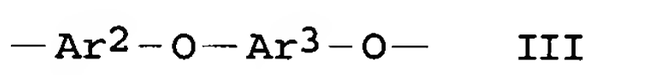
GI



I



II



III

AB The **membrane** has **ion exchanger** resin in the continuous through holes in a support **membrane**, where the **ion exchanger** resin contains an aromatic ether and/or its derivative, formed by polymerization of mixture containing monomers I (Q =-SO2- or -CO-, X = H, Li, NA, or K, Y = F, Cl, Br, or I), aromatic dihalides, and bisphenol compound and alkali metal (bi)carbonate. The **ion exchange** resin contain 0-1000 structural units II (Z = H, Li, Na, K, or cation derived. from aliphatic or aromatic amines; Ar1 and Ar3 = bivalent organic groups, Ar2 = bivalent organic groups containing ≥1 arom ring having electron attracting group) and 0-1000 structural units III. The composite **membrane** may be used as fuel cell electrolyte.

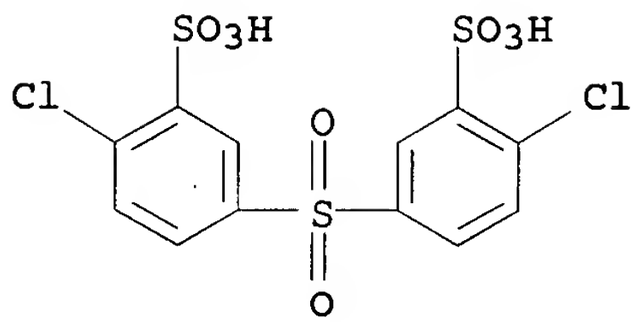
IT **146673-89-4 267877-35-0 681035-31-4**
RL: TEM (Technical or engineered material use); USES (Uses)
(composite **membranes** containing **ion exchanger** resins in porous polymer support **membranes** for fuel cell electrolytes)

RN 146673-89-4 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

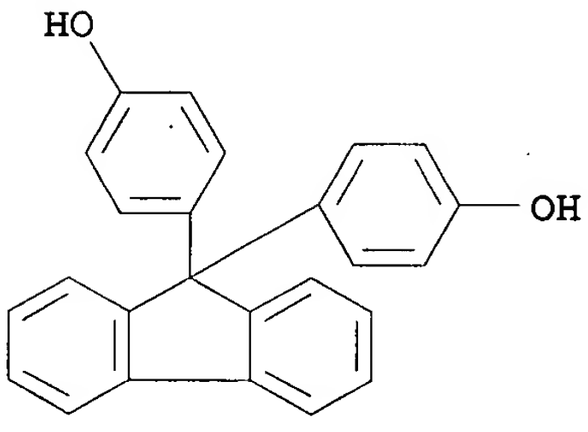
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

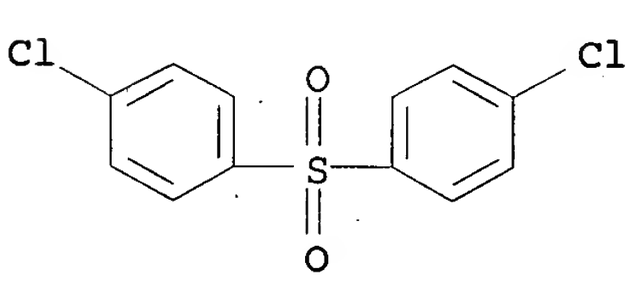
CM 2

CRN 3236-71-3
CMF C25 H18 O2



CM 3

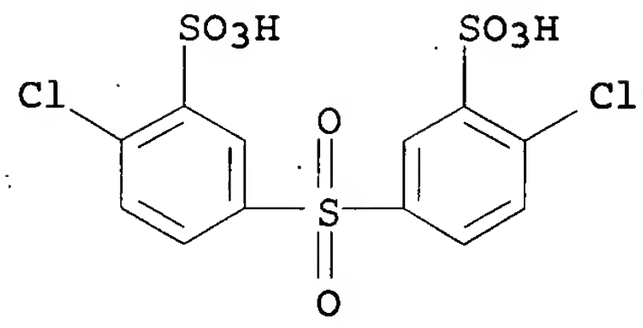
CRN 80-07-9
CMF C12 H8 Cl2 O2 S



RN 267877-35-0 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

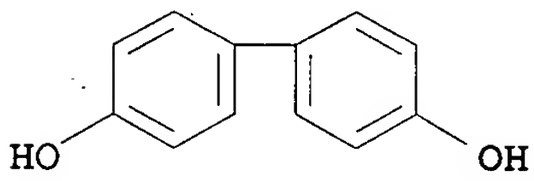
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

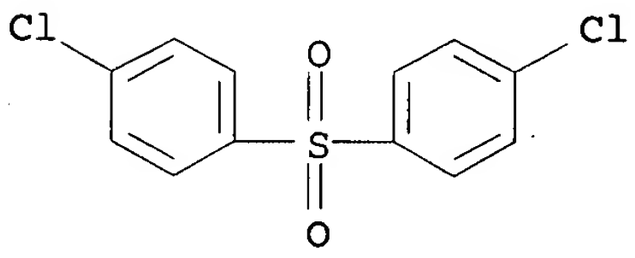
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

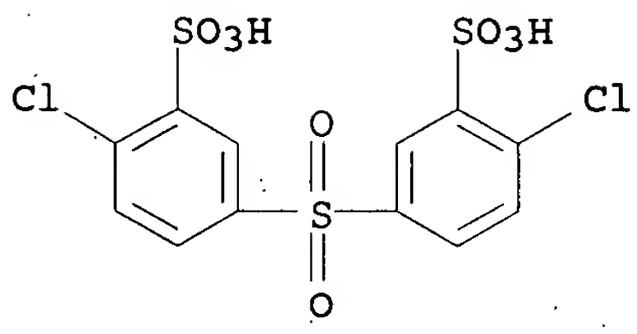
CRN 80-07-9
CMF C12 H8 Cl2 O2 S



RN 681035-31-4 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 2,6-dichlorobenzonitrile (CA INDEX NAME)

CM 1

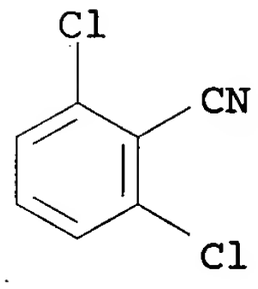
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

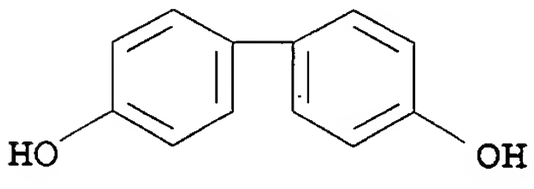
CM 2

CRN 1194-65-6
CMF C7 H3 Cl2 N



CM 3

CRN 92-88-6
CMF C12 H10 O2



IC ICM H01M008-02
ICS C08J005-22
CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 52
ST composite **ion exchanger membrane** compn
fuel cell electrolyte
IT Fuel cell electrolytes
(composite **membranes** containing **ion exchanger** resins in porous polymer support **membranes** for fuel cell electrolytes)
IT Polyphosphoric acids
RL: TEM (Technical or engineered material use); USES (Uses)
(composite **membranes** containing **ion exchanger** resins in porous polymer support **membranes** for fuel cell electrolytes)
IT 75-75-2, Methanesulfonic acid 60871-72-9 **146673-89-4** **267877-35-0** **681035-31-4**
RL: TEM (Technical or engineered material use); USES (Uses)

(composite **membranes** containing **ion exchanger** resins in porous polymer support **membranes** for fuel cell electrolytes)

L24 ANSWER 5 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:896528 HCAPLUS
DOCUMENT NUMBER: 140:95080
TITLE: Effect of acidification treatment and morphological stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°
AUTHOR(S): Kim, Yu Seung; Wang, Feng; Hickner, Michael; Mccartney, Stephan; Hong, Young Taik; Harrison, William; Zawodzinski, Thomas A.; Mcgrath, James E.
CORPORATE SOURCE: Department of Chemistry and Materials Research Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Journal of Polymer Science, Part B: Polymer Physics (**2003**), 41(22), 2816-2828
CODEN: JPBPEM; ISSN: 0887-6266
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English

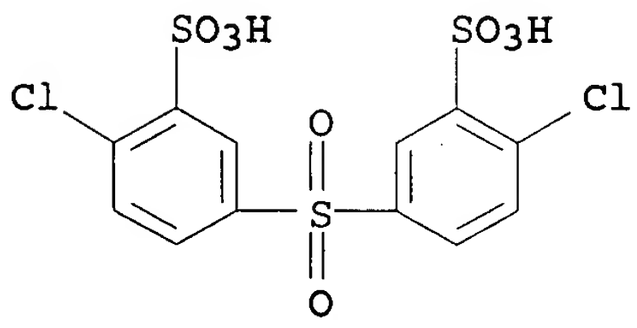
AB Directly copolymd. wholly aromatic sulfonated poly(arylene ether sulfone) copolymers derived from 4,4'-biphenol, 4,4'-dichlorodiphenyl sulfone, 3,3'-disulfonated, and 4,4'-dichlorodiphenyl sulfone (BPSH) were evaluated as proton-exchange **membranes** for elevated temperature operation (100°-140°). Acidification of the copolymer from the sulfonated form after the nucleophilic step (condensation) copolymn. involved either immersing the solvent-cast **membrane** in sulfuric acid at 30° for 24 h and washing with water at 30° for 24 h (method 1) or immersion in sulfuric acid at 100° for 2 h followed by similar water treatment at 100° for 2 h (method 2). The fully hydrated BPSH **membranes** treated by method 2 exhibited higher proton conductivity, greater water absorption, and less temperature dependence on proton conductivity as compared with the **membranes** acidified at 30°. In contrast, the conductivity and water absorption of a control perfluorosulfonic acid copolymer (Nafion 1135) were invariant with treatment temperature; however, the conductivity of the Nafion **membranes** at elevated temperature was strongly dependent on heating rate or temperature Tapping-mode atomic force microscope results demonstrated that all of the **membranes** exposed to high-temperature conditions underwent an irreversible change of the ionic domain microstructure, the extent of which depended on the concentration of sulfonic acid sites in the BPSH system. The effect of aging **membranes** based o BPSH and Nafion at elevated temperature on proton conductivity is also discussed.

IT **267877-35-0DP**, proton-exchanged
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)

RN 267877-35-0 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

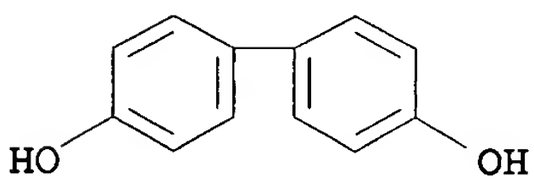
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

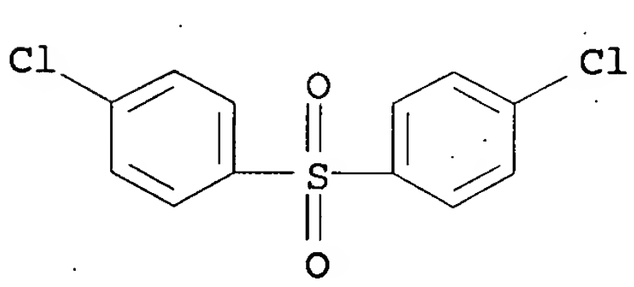
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



CC 38-3 (Plastics Fabrication and Uses)
ST sulfonated polyether polysulfone proton exchange **membrane** morphol acidification treatment; fuel cell sulfonated polyether polysulfone proton exchange **membrane** conduction
IT Fuel cells
Ion exchange membranes
Polymer morphology
(effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)
IT Polysulfones, uses
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or

engineered material use); PREP (Preparation); USES (Uses)
(polyether-, aromatic; effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)

IT Polyethers, uses
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(polysulfone-, aromatic; effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)

IT Ionic conductivity
(proton; effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)

IT Absorption
(water; effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)

IT **267877-35-0DP**, proton-exchanged
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(effect of acidification treatment and morphol. stability of sulfonated poly(arylene ether sulfone) copolymer proton-exchange **membranes** for fuel-cell use above 100°)

REFERENCE COUNT: 32 THERE ARE 32 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L24 ANSWER 6 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:644802 HCAPLUS
DOCUMENT NUMBER: 139:339981
TITLE: Processing induced morphological development in hydrated sulfonated poly(arylene ether sulfone) copolymer **membranes**
AUTHOR(S): Kim, Yu Seung; Dong, Limin; Hickner, Michael A.; Pivovar, Bryan S.; McGrath, James E.
CORPORATE SOURCE: Department of Chemistry and Institute for Polymeric Materials and Interfaces, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Polymer (**2003**), 44(19), 5729-5736
CODEN: POLMAG; ISSN: 0032-3861
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB The development of morphol. solid-state structures in sulfonated poly(arylene ether sulfone) copolymers (acid form) by hydrothermal treatment was investigated by water uptake, dynamic mech. anal. (DMA), and tapping mode atomic force microscopy (TM-AFM). The water uptake and DMA studies suggested that the materials have 3 irreversible morphol. regimes, whose intervals are controlled by copolymer composition and hydrothermal treatment temperature Ambient temperature treatment of the **membranes** afforded a structure denoted as Regime1. When the copolymer **membranes** were exposed to a higher temperature, AFM revealed a morphol. (Regime2) where the phase contrast and domain connectivity of the hydrophilic phase of the

copolymers were greatly increased. A yet higher treatment temperature was defined which yielded a third regime, likely related to viscoelastic relaxations associated with the hydrated glass transition temperature (hydrated Tg). The required temps. needed to produce transitions from Regime1 to Regime2 or Regime3 decreased with increasing degree of disulfonation. These temps. correspond to the percolation and hydrogel temps., resp. Poly(arylene ether sulfone) copolymer **membranes** with a 40% disulfonation in Regime2 under fully hydrated conditions showed similar proton conductivity (.apprx.0.1 S/cm) to the well-known perfluorinated copolymer Nafion 1135 but exhibited higher modulus and water uptake. The proton conductivity and storage modulus are discussed in terms of each of the morphol. regimes and compared with Nafion 1135. The results are of particular interest for either hydrogen or direct methanol fuel cells where conductivity and **membrane** permeability are critical issues.

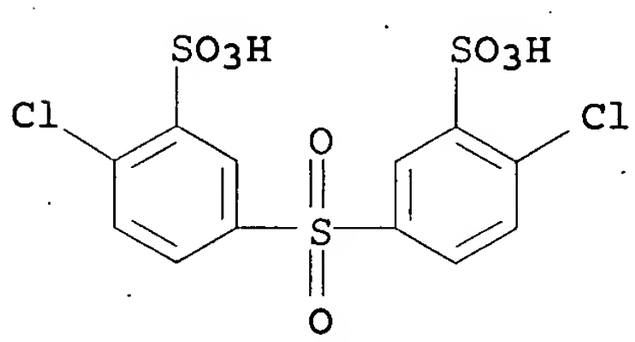
IT **267877-35-0DP**, hydrolyzed
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)

RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

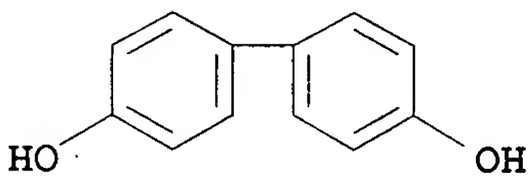
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

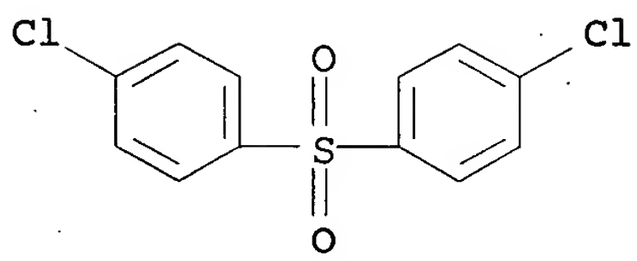
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST sulfonated polyether polysulfone **membrane** hydrothermal treatment morphol proton cond
IT Polysulfones, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(polyether-, aromatic; solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT Polyethers, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(polysulfone-, aromatic; solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT **Ion exchange membranes**
Ionic conductivity
(proton; solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT Glass transition temperature
Polymer morphology
Storage modulus
(solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT Ionomers
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT Deformation (mechanical)
(tensile; solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT Relaxation
(viscoelastic; solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT Adsorption
(water; solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
IT **267877-35-0DP**, hydrolyzed
RL: PRP (Properties); SPN (Synthetic preparation); PREP

(Preparation)
(solid-state morphol. of sulfonated poly(arylene ether sulfone) copolymer proton exchange **membranes** induced by hydrothermal treatment)
REFERENCE COUNT: 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L24 ANSWER 7 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:560877 HCAPLUS
DOCUMENT NUMBER: 139:292987
TITLE: An investigation of proton conduction in select PEM's and reaction layer interfaces-designed for elevated temperature operation
AUTHOR(S): Ma, Chengsong; Zhang, Lei; Mukerjee, Sanjeev; Ofer, David; Nair, Bindu
CORPORATE SOURCE: Department of Chemistry, Northeastern University, Boston, MA, 02115, USA
SOURCE: Journal of Membrane Science (**2003**), 219(1-2), 123-136
CODEN: JMESDO; ISSN: 0376-7388
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The proton conductivity of several alternative proton exchange **membranes**, i.e. SPES-40 (a sulfonated polyarylene ether sulfone), SPSS-40 (sulfonated polysulfide sulfone) and SPES-PS (a polyether sulfone post-sulfonated) were studied using a four-probe ac-impedance method as a function of temperature Further, proton conductivity was also investigated for the same ionomers in the form of micro-aggregates such as those typically encountered in the reaction layer (the interfacial layer of the electrode containing the catalyst). For this a new configuration of the conventional reaction layer in a **membrane** electrode assembly (MEA) was used, which enabled the isolation of proton conductivity to be the principle contributor to the ac-impedance. The results under 100% relative humidity, showed that SPES-40 has similar proton conductivity as Nafion in the **membrane** within our exptl. conditions. The values for the other **membranes** investigated were lower. Attempts to correlate these observed differences with parameters such as equivalent weight (EW), water uptake (λ), acidity (pKa), etc. showed that the prime contributor was the difference in microstructure of the **membranes**. Conductivity of these polymeric ionomers when present as micro-aggregates in the reaction layer showed very different values as compared to the bulk **membranes**. There was a great divergence in conduction as a function of increase in temperature with Nafion showed a far greater rate of increase of conductivity than SPES-50 and SPES-PS. Blends of these ionomers with Nafion showed intermediate values, albeit lower with characteristics closer to Nafion. Single cell PEM polarization curves were measured for both Nafion 117 and SPES-40 **membrane** keeping the ionomer in the reaction layer same as the **membrane**. Comparison of the performance showed similar ohmic polarization characteristics. However, their performance in the low c.d. activation polarization region indicated poorer oxygen reduction reaction kinetics with SPES-40 material as compared to Nafion.
IT **267877-35-0**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

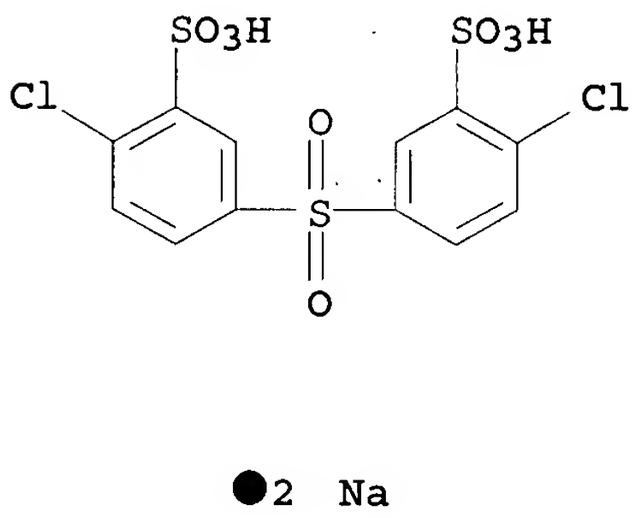
(proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

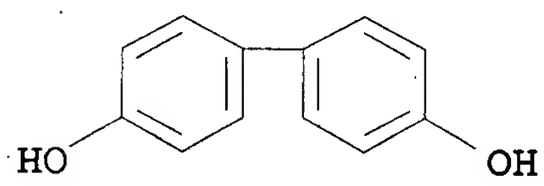
CM 1

CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



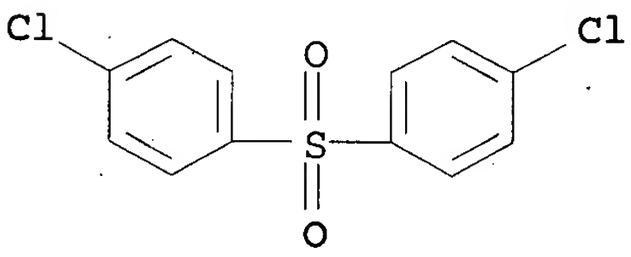
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 52

ST fuel cell proton exchange **membrane** interface proton cond

IT Polysulfones, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered

material use); PROC (Process); USES (Uses)
(polyether-; proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT Polythioethers
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(polysulfone-, sulfonated; proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT Polyethers, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(polysulfone-; proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT Polysulfones, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(polythioether-, sulfonated; proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT **Cation exchange membranes**
Fuel cells
Interface
(proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT Ionomers
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT Ionic conductivity
(proton; proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

IT 25839-81-0D, Radel R, sulfonated 66796-30-3, Nafion 117
267877-35-0
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(proton conduction in proton exchange **membranes** and high-temperature reaction layer interfaces for fuel cells)

REFERENCE COUNT: 37 THERE ARE 37 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L24 ANSWER 8 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:326153 HCAPLUS
DOCUMENT NUMBER: 139:101749
TITLE: Electrochemical characterization of sulfonated poly(arylene ether sulfone) (S-PES) **cation-exchange membranes**
AUTHOR(S): Kang, Moon-Sung; Choi, Yong-Jin; Choi, Ik-Jun; Yoon, Tae-Ho; Moon, Seung-Hyeon
CORPORATE SOURCE: Department of Environmental Science and

Engineering, Kwang-Ju Institute of Science and Technology (K-JIST), Buk-gu, Gwangju, 500-712, S. Korea
SOURCE: Journal of Membrane Science (2003), 216(1-2), 39-53
CODEN: JMESDO; ISSN: 0376-7388
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Sulfonate poly(arylene ether sulfone) (S-PES) **cation-exchange membranes** with various degrees of sulfonation were prepared via direct polymerization of sulfonate monomer and characterized in terms of electrochem. properties, including surface heterogeneity and current-voltage (I-V) relation. The S-PES **membranes** exhibited moderate swelling and **ion-exchange** capacity (IEC) suitable for electro-**membrane** applications. The **membranes** with mole ratio of sulfonate group of over 40% showed excellent electrochem. properties. The elec. resistance is below 1.0 Ω cm2 in 0.5 mol dm-3 NaCl electrolyte and the ionic permselectivity of the **membranes** is comparable to that of com. **membranes.** The fraction of conducting regions, .vepsiln., on the **membrane** surface was evaluated through a chronopotentiometry. The .vepsiln. of S-PES **membranes** was higher than that of sulfonated poly(arylene ether sulfone) **membranes** prepared via conventional post-sulfonation, leading to low elec. resistance and high ionic permselectivity.

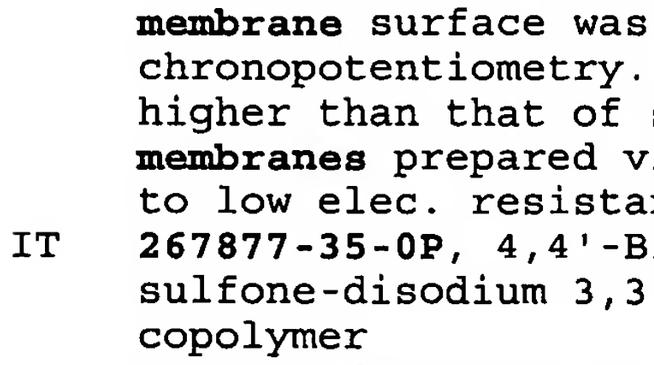
IT **267877-35-0P**, 4,4'-Biphenol-4,4'-dichlorodiphenyl sulfone-disodium 3,3'-sulfonylbis(6-chlorobenzenesulfonate) copolymer
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation-exchange membrane**)

RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

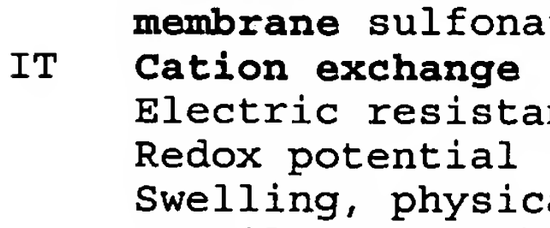
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

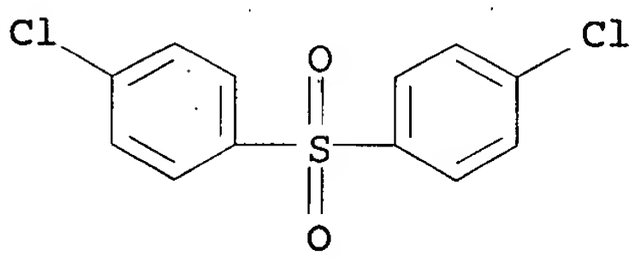
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



CC 37-5 (Plastics Manufacture and Processing)
Section cross-reference(s): 38, 72
ST sulfonated polyarylene ether sulfone swelling **ion exchange** capacity; **cation exchange membrane** sulfonated polyarylene polyether polysulfone
IT **Cation exchange**
Electric resistance
Redox potential
Swelling, physical
Tensile strength
(elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation-exchange membrane**)
IT Polysulfones, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(polyether-; elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation-exchange membrane**)
IT Polyethers, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(polysulfone-; elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation-exchange membrane**)
IT Permeability
(selective; elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation-exchange membrane**)
IT Electric conductivity
(surface, selective; elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation-exchange membrane**)

IT **267877-35-0P**, 4,4'-Biphenol-4,4'-dichlorodiphenyl sulfone-disodium 3,3'-sulfonylbis(6-chlorobenzenesulfonate) copolymer
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(elec. resistance and ion permselectivity and redox potential of sulfonated poly(arylene ether sulfone) for use as **cation -exchange membrane**)

REFERENCE COUNT: 29 THERE ARE 29 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L24 ANSWER 9 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2002:241166 HCAPLUS
DOCUMENT NUMBER: 136:265821
TITLE: Ion-conducting sulfonated polymeric materials
INVENTOR(S): McGrath, James E.; Hickner, Michael; Wang, Feng; Kim, Yu-Seung
PATENT ASSIGNEE(S): Virginia Tech Intellectual Properties, Inc., USA
SOURCE: PCT Int. Appl., 46 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002025764	A1	20020328	WO 2001-US29293	20010920 <--
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
CA 2421627	A1	20020328	CA 2001-2421627	20010920 <--
AU 200192804	A	20020402	AU 2001-92804	20010920 <--
EP 1327278	A1	20030716	EP 2001-973199	20010920 <--
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
JP 2004509224	T	20040325	JP 2002-528869	20010920 <--

PRIORITY APPLN. INFO.: US 2000-234177P P 200009 20 <--
WO 2001-US29293 W 200109 20 <--

AB Sulfonated polymers are made by the direct polymerization of a sulfonated monomer to form the sulfonated polymers. The types of sulfonated polymers may include polysulfones or polyimides. The sulfonated polymers can be formed into **membranes** that may be used in proton exchange **membrane** fuel cells or as **ion exchange membranes.** The **membranes** formed from the sulfonated polymers exhibit improved properties over that of Nafion. A heteropoly acid may be added to the sulfonated polymer to form a nanocomposite **membrane** in which the heteropoly acid is highly dispersed. The addition of a heteropoly acid to the sulfonated polymer increases the thermal stability of the **membrane**, enhances the conductivity above 100°, and reduces the water uptake of the **membrane.**

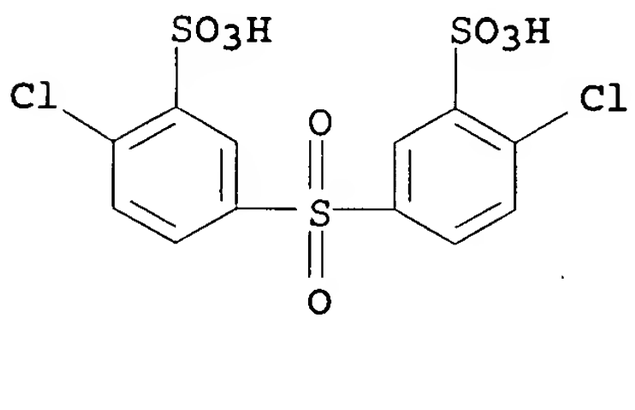
IT **267877-35-0P**
RL: DEV (Device component use); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**ion**-conducting sulfonated polymeric materials)

RN 267877-35-0 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

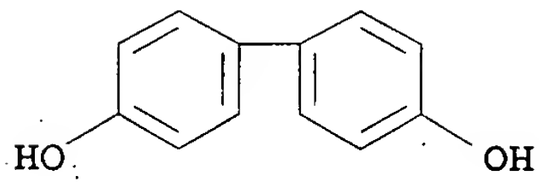
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

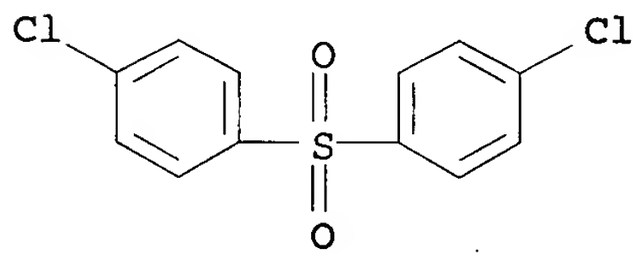
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



IC ICM H01M008-10
ICS C08G069-26; C08G075-00
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 37
ST fuel cell **membrane** sulfonated polymer heteropoly acid nanocomposite; **ion exchange membrane** sulfonated polymer heteropoly acid nanocomposite
IT **Ion exchange membranes**
(**ion**-conducting sulfonated polymeric materials)
IT Fuel cells
(proton **exchange membrane**; **ion**-conducting sulfonated polymeric materials)
IT **267877-35-0P** 302924-87-4DP, proton **exchanged** derivs. 302924-87-4P
RL: DEV (Device component use); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**ion**-conducting sulfonated polymeric materials)
REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L24 ANSWER 10 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2002:93463 HCAPLUS
DOCUMENT NUMBER: 136:310780
TITLE: Direct polymerization of sulfonated poly(arylene ether sulfone) random (statistical) copolymers: candidates for new proton exchange **membranes**
AUTHOR(S): Wang, Feng; Hickner, Michael; Kim, Yu Seung; Zawodzinski, Thomas A.; McGrath, James E.
CORPORATE SOURCE: Department of Chemistry and Materials Research Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA
SOURCE: Journal of Membrane Science (**2002**), 197(1-2), 231-242
CODEN: JMESDO; ISSN: 0376-7388
PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal
LANGUAGE: English

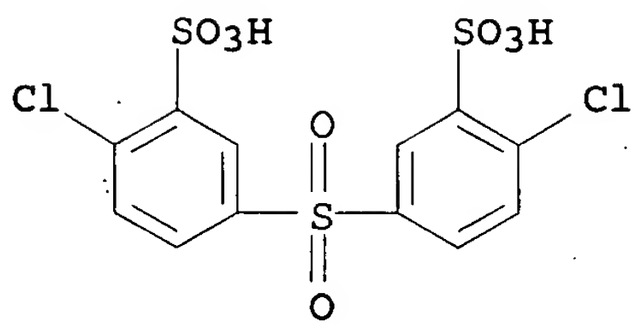
AB Novel biphenol-based wholly aromatic poly(arylene ether sulfone)s containing up to two pendant sulfonate groups per repeat unit were prepared by potassium carbonate mediated direct aromatic nucleophilic substitution polycondensation of disodium 3,3'-disulfonate-4,4'-dichlorodiphenylsulfone (SDCDPS), 4,4'-dichlorodiphenylsulfone (DCDPS) and 4,4'-biphenol. Copolymn. proceeded quant. to high mol. weight in N-methyl-2-pyrrolidinone at 190 °C. Tough **membranes** with a SDCDPS/DCDPS mole ratio up to 60:40 were successfully cast using N,N-dimethylactamide. An increase of sulfonate groups in the copolymer resulted in increased glass transition temperature, enhanced **membrane** hydrophilicity, and intrinsic viscosity; the 100% SDCDPS homopolymer was water soluble The acid form **membranes** were successfully obtained by treating the sodium form of the **membranes** with dilute sulfuric acid solution Thermogravimetric anal. shows that the sodium form materials have enhanced thermal stability relative to the acid form, as expected. Atomic force microscopy (AFM) phase images of the acid form **membranes** clearly show the hydrophilic domains, with sizes increasing from 10 to 25 nm as a function of the degree of sulfonation. A phase inversion could be observed for the 60% SCSDPS copolymer, which was consistent with a rapid increase in water absorption. Short-term aging (30 min) indicates that the desired acid form **membranes** are stable to 220 °C in air and conductivity values at 30 °C of 0.11 S/cm (SDCDPS/DCDPS=0.4) and 0.17 S/cm (SDCDPS/DCDPS=0.6) were measured, which are comparable to or higher than the state-of-the-art fluorinated copolymer Nafion 1135 control (0.12 S/cm). The conductivity is greatly influenced by **ion exchange** capacity, temperature, and water activity. The new copolymers, which contain ion conductivity sites on the deactivated positions of the aryl backbone rings, are candidates as new polymeric electrolyte materials for proton exchange **membrane** (PEM) fuel cells.

IT **267877-35-0P**
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)

RN 267877-35-0 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

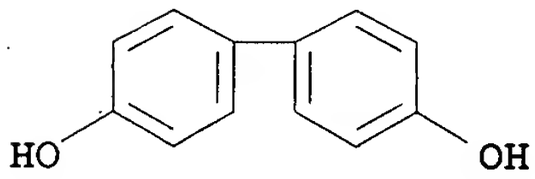
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

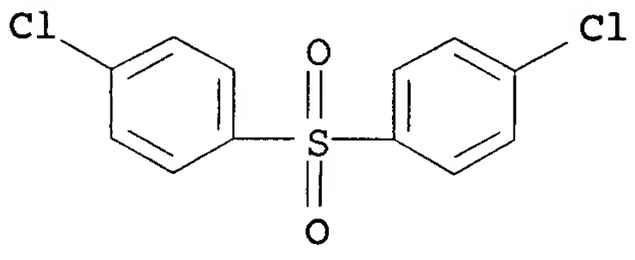
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

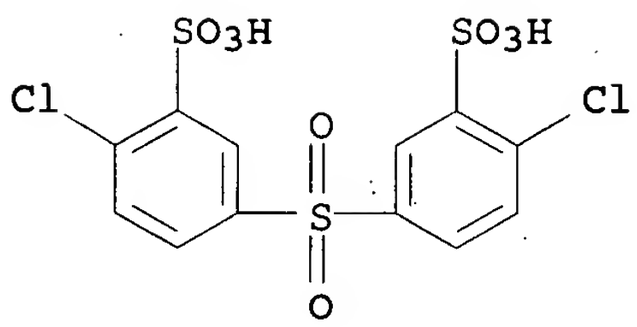
CRN 80-07-9
CMF C12 H8 Cl2 O2 S



IT **267877-35-0DP**, hydrolyzed
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)
RN 267877-35-0 HCAPLUS
CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, sodium salt (1:2), polymer with [1,1'-biphenyl]-4,4'-diol and 1,1'-sulfonylbis[4-chlorobenzene] (CA INDEX NAME)

CM 1

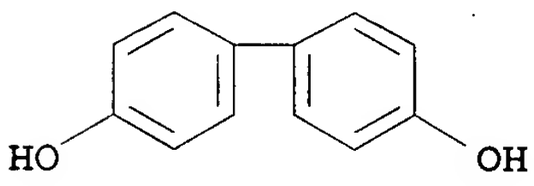
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

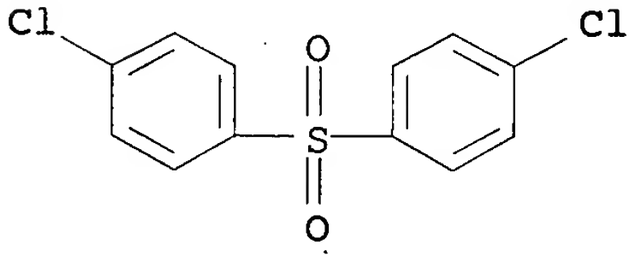
CM 2

CRN 92-88-6
CMF C12 H10 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 35
ST nucleophilic substitution polycondensation disodium disulfonatodichlorodiphenylsulfone dichlorodiphenylsulfone biphenol potassium carbonate; polyether polysulfone **membrane** prepn
IT Electric conductivity
Glass transition temperature
Membranes, nonbiological
Thermal stability
Viscosity
(preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)
IT Adsorption
(water; preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)
IT 584-08-7, Potassium carbonate

RL: CAT (Catalyst use); USES (Uses)
(preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)

IT **267877-35-0P**
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)

IT **267877-35-0DP**, hydrolyzed
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation, thermal, elec., and rheol.. properties of sulfonated poly(arylene ether sulfone) as candidates for new proton exchange **membranes**)

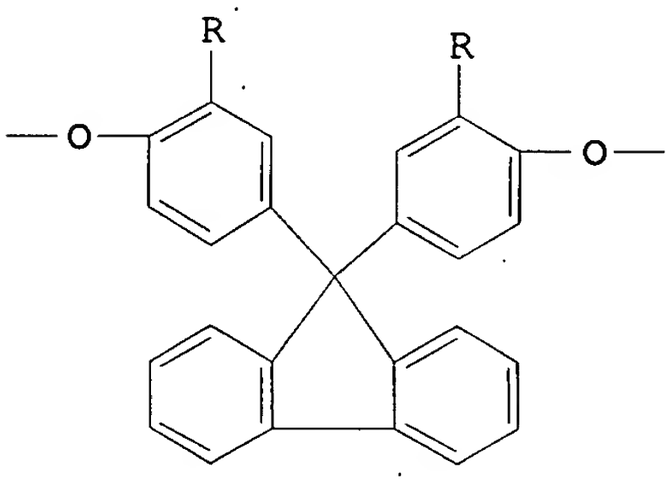
REFERENCE COUNT: 37 THERE ARE 37 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L24 ANSWER 11 OF 11 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1993:409381 HCAPLUS
DOCUMENT NUMBER: 119:9381
TITLE: heat-resistant sulfonated polysulfones
INVENTOR(S): Harada, Yoshiyuki; Teramoto, Takeo
PATENT ASSIGNEE(S): Nippon Steel Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 05001149	A	19930108	JP 1991-178920 <--	19910625

PRIORITY APPLN. INFO.: JP 1991-178920 <-- 19910625

GI



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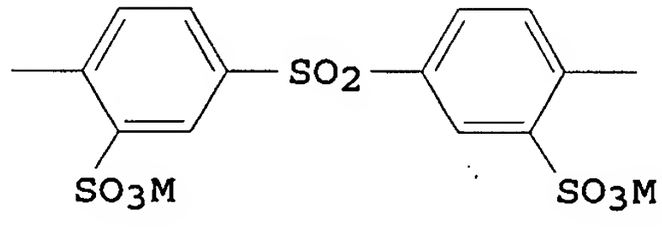


II

AB Title polysulfones with controllable sulfonation ratio and good yield, useful as materials of **ion-exchange** resins and separation **membranes**, have repeating units (XY)m(XZ)n [X = I (R = H, Me, Et); Y = -p-C6H4SO2-p-C6H4-; Z = II (M = H, alkali metal, tetraalkylammonium); m, n = repeating number; Y/Z mol ratio 99/1-1/100] and inherent viscosity 0.3-3.0. Thus, 9,9-bis(4-hydroxyphenyl)fluorene 20, 4,4'-dichlorodiphenyl sulfone 19, and di-Na 4,4'-dichlorodiphenyl sulfone-3,3'-disulfonate 1 mmol were mixed with K2CO3, dimethylacetoamide, toluene, dehydrated, and treated at 120° for 15 h and at 160° for 24 h to give a sulfonated polysulfone with Y/Z mol ratio 95/5, yield 100%, inherent viscosity 0.86 dL/g, **ion-exchange** volume 0.14 meq/g, and water contact angle 69.6° (air side) and 61.5° (glass surface side).

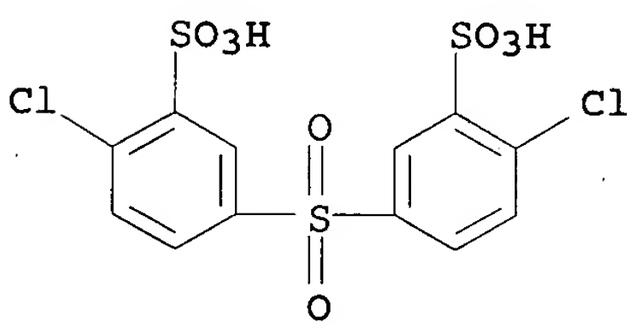
IT **146673-89-4P**
RL: PREP (Preparation)
(preparation of, heat-resistant, for **ion-exchange** resins and separation **membranes**)

RN 146673-89-4 HCAPLUS

CN Benzenesulfonic acid, 3,3'-sulfonylbis[6-chloro-, disodium salt, polymer with 4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

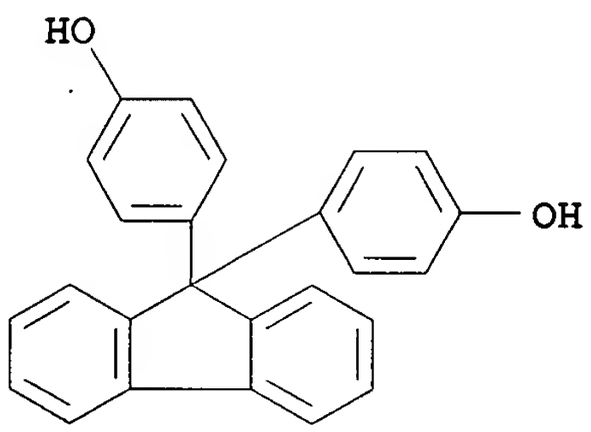
CRN 51698-33-0
CMF C12 H8 Cl2 O8 S3 . 2 Na



●2 Na

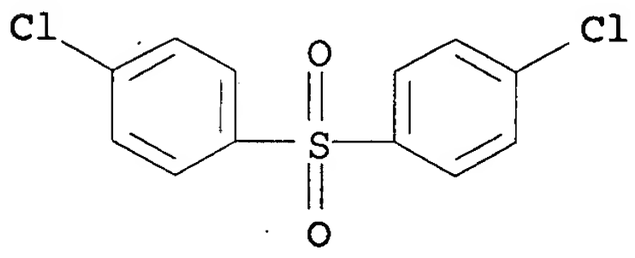
CM 2

CRN 3236-71-3
CMF C25 H18 O2



CM 3

CRN 80-07-9
CMF C12 H8 Cl2 O2 S



IC ICM C08G075-20
CC 35-5 (Chemistry of Synthetic High Polymers)
Section cross-reference(s): 38
ST heat resistance sulfonated polysulfone; **ion exchange** resin sulfonated polysulfone; sepn **membrane** sulfonated polysulfone
IT **Ion exchangers**
(sulfonated polysulfones for, heat-resistant)
IT **Membranes**
(sulfonated polysulfones, heat-resistant)
IT Heat-resistant materials
(sulfonated polysulfones, preparation of, for **ion-exchange** resins and separation **membranes**)
IT Polysulfones, compounds
RL: PREP (Preparation)
(sulfonated, preparation of, heat-resistant, for **ion-exchange** resins and separation **membranes**)
IT **146673-89-4P**
RL: PREP (Preparation)
(preparation of, heat-resistant, for **ion-exchange** resins and separation **membranes**)

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